

DESIGN REQUIREMENTS FOR SRB PRODUCTION CONTROL SYSTEM

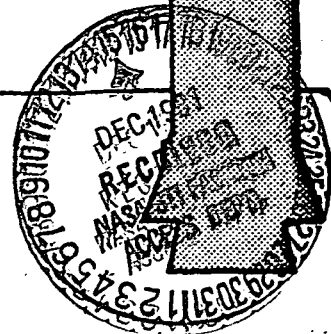
FINAL REPORT

VOLUME V

APPENDICES

SUBMITTED BY:

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DESIGN REQUIREMENTS FOR THE SRB PRODUCTION CONTROL SYSTEM

VOLUME V

APPENDICES

TABLE OF CONTENTS

Material Management Audit Checklist
Software Package Vendor Questionnaire
APICS Dictionary

NASA/SRB MANUFACTURING
CONTROL SYSTEM

MATERIAL MANAGEMENT AUDIT
CHECK LIST

Table of Contents

<u>Title</u>
Production Planning
Product Scheduling
Shop Floor Control
Production Reporting
Production Dispatching
Inventory Planning
Material Handling and Storage
Inventory Centers
Product Engineering
Procurement
Computer Support
Documentation
Receiving
Inspection - Inbound
Quality Control

PRODUCTION PLANNING

ORGANIZATION

- Who is responsible?
- Where does function reside?
- How is it organized internally?
- Is the staffing adequate
 - . Qualitatively?
 - . Quantitatively?

CHARACTERISTICS

- Are manufacturing facilities identified and classified for planning purposes? Obtain listing of departments, work centers, or their equivalent.
- Are the classifications logical for this purpose? Shortcomings, if any.
- Are productive capacities
 - . Known? . Current?
 - . Used? . Accurate?
- Is productive capacity committed (inputs) to new manufacturing orders? How? When?
- How are capacities expressed?
 - . Time? . Physical units? . Other?

PRODUCTION PLANNING (Cont'd.)

METHODS

- Is production planned by
 - . Facilities? . Product Groups?
 - . Other? . Both?
- What is the planning horizon or visibility?
- What are the "time buckets"?
- How are the plans
 - . Documented?
 - . Disseminated to others? Who gets copies of production plan and for what purpose do they use them?

HOW AND FREQUENCY ARE PRODUCTION PLANS?

- Monitored?
- Updated or changed?

WHAT ARE INPUTS TO THE PLANS?

- Current manufacturing orders
- Inventory replenishment orders
- Production capacity data
- Projections of future requirements and flights

PRODUCTION PLANNING (Cont'd.)

WHAT POLICIES AND GUIDELINES ARE IN USE?

- Do stated and actual agree?

HOW DOES PLANNING COMPARE/CONTRAST FOR

- Basic work centers?
- Assembly work centers?
- Special operations?
- Stock inventory items versus
special orders? (If applicable)
- A-B-C classifications?

PRODUCTION SCHEDULING

ORGANIZATION

- Where does the function reside within the division?
- Internal organization?
- Are personnel adequate
 - . Quantitatively? . Qualitatively?

HOW ARE PRODUCTION PLANS TRANSLATED INTO PRODUCTION SCHEDULES?

HOW ARE SPECIFIC ITEMS PLACED INTO SPECIFIC SCHEDULES? SEQUENCE, PRIORITY, ET AL.

ARE IN-PROCESS LEAD TIMES: WHAT ARE L.T. ELEMENTS?

- Used? - Accurate? - Current?

WHAT "TIME BUCKETS" ARE USED?

- Weeks - Days - Shifts - Combination

HOW "HARD" OR FROZEN IS THE SCHEDULE?

- When can it be changed?
- Who has authority to change it?

WHO GETS COPIES OF THE SCHEDULES AND FOR WHAT PURPOSE DO THEY USE THEM?

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SHOP FLOOR CONTROL

ORGANIZATION

- Who is responsible?
- Where does function report?
- How is function organized?
- How staffed?

ELEMENTS BY WHICH CONTROL IS EXERCISED

- Groups of parts (lots)?
- Manufacturing orders?
- Equipment?
- Operations?

INFORMATION FLOW

- Documents prepared in PICS department?
- Documents originated in shop?
- Some of each?
- Other?

SHOP FLOOR CONTROL (Cont'd.)

RECORDS AND REPORTS

- What are they?
- Are they
 - . In suitable format?
 - . Timely?
 - . Accurate?
- List reports with sample page

DOES CONTROL INCLUDE MONITORING PRODUCTION?

- How?
- How frequently?

DOES CONTROL INCLUDE PROVISION FOR CORRECTIVE ACTION?

- What action?
- By whom?
- Is responsibility/authority clear?

PRODUCTION REPORTING

FROM WHAT DEPARTMENTS/FUNCTIONS IS PRODUCTION
REPORTED?

WHAT DATA IS REPORTED?

- Pieces produced? - Weight?
- Running time? - Setup time?
- Part number? - Order number?
- Lot number? - Date? - Shift?
- Scrap? - Employee clock number?

HOW IS DATA REPORTED?

- Mechanical devices
- Documents
 - . Originated in PICS which "turnaround"
 - . Originated shop

WHO USES REPORTED PRODUCTION DATA?

- PICS? - Order processing?
- Quality control? - Payroll?
- Standard cost? - Manufacturing engineering?
- Product managers?

PRODUCTION REPORTING (Cont'd.)

HOW IS IT USED? WHAT ACTION TAKEN?

IS REPORTING TIMELY? ACCURATE?

HOW IS PRODUCT IDENTIFIED IN THE SHOP?

PRODUCTION DISPATCHING

ARE PRODUCTION DEPARTMENTS

- Under control of dispatching which should not be?
- Not under control of dispatching which should be?

WHAT INFORMATION IS DISPATCHED?

IS DISPATCHED INFORMATION

- In an acceptable format?
- Timely? - Complete? - Accurate?

ORGANIZATION

- How is function organized
 - . In the division?
 - . Internally?
- Is staffing adequate
 - . Quantitatively?
 - . Qualitatively?

CAN DISPATCHED WORK BE PHYSICALLY RETRIEVED

- Easily?
- Accurately?

PRODUCTION DISPATCHING (Cont'd.)

IS EXPEDITING

- Part of dispatching?
- Satisfactorily
 - . Initialized?
 - . Controlled?
- Effective?

INVENTORY PLANNING

ORGANIZATION

- Who is in charge?
- Where does function report in division?
- What is internal organization?
- Is staffing adequate
 - . Quantitatively?
 - . Qualitatively?

IS PLANNING ORGANIZED BY

- Classifications
 - . Planned?
 - . Unplanned?
 - . Applied?
- Product
 - . Types or markets?
- Levels
 - . Raw material?
 - . Parts?
 - . Subassemblies?
 - . Finished?
 - . Work-in-process?

INVENTORY PLANNING (Cont'd.)

POLICIES

- Are they in writing? Current? Used?
- Who issues them? Maintains them?

WHAT ARE DATA SOURCES FOR PLANNING?

- Flight schedules
- Stock status data
- Financial constraints
- Usage history
- Engineering changes

TIMING CONSIDERATIONS

- How often is a plan developed?
- What is the horizon?
- What "buckets" are used?
- Is the plan rolled ahead on an add/drop basis?

USES

- Who receives the plan?
- What do they do with it?

INVENTORY PLANNING (Cont'd.)

WHAT REPORTS AND RECORDS ARE USED?

- Are they
 - . Accurate? . Legible? . Timely?
- What is the format of the plan itself?

WHAT TECHNIQUES ARE UTILIZED (METHODOLOGY OR CRITERIA)

. A-B-C . EOQ . OP/OQ . MRP . BIN-TAG

HOW ARE INVENTORY PARAMETERS DEVELOPED? IS THERE A
SAFETY STOCK ALLOWANCES?

IS PLANNING EFFECTIVENESS MONITORED? HOW?

- Adherence to maximums?
- Turnover ratios?
- Achievement of service levels?

WHAT INVENTORY GENERAL LEDGER ACCOUNTS ARE USED?
NAME AND NUMBER.

MATERIAL HANDLING AND STORAGE

ARE STORAGE AREAS SHIP-SHAPE?

- Clearly marked
- Organized locator system
- Limited or controlled access
- Effectively utilized
- Stock rotation practiced

ARE ALL MOVEMENTS ACCOUNTED FOR?

- Promptly?
- In sufficient detail?

IS MATERIAL HANDLING EQUIPMENT EFFECTIVE?

HOW ORGANIZED AND STAFFED?

- Report to whom?
- Apparent skill levels?
- Controls used?

INVENTORY CONTROL

ORGANIZATION

- Who is in charge?
- Where does function report?
- Is staffing adequate?

WHAT TECHNIQUES ARE UTILIZED?

- Usage value (A-B-C)
- EOQ's
- Minimum/maximum
- Safety stock

WHAT RECORDS ARE MAINTAINED AND INFORMATION RECORDED?

CITE SIMILARITIES AND DIFFERENCES OF METHODOLOGY BETWEEN

- Raw materials
- Parts
- Subassemblies
- Finished goods
- Purchased versus made in-house
- Stock and nonstock item controls

INVENTORY CONTROL (Cont'd.)

WHAT LEVEL OF DETAIL IS MAINTAINED?

- By site
- By serial number
- Age
- New or refurbished

DO CONTROLS PROVIDED ADEQUATE FOCUS ON, AND
EMPHASIZE DISPOSITION OF,

- Obsolete or slow moving
- Perishable
- Scrap or spoilage

ARE CYCLE COUNTS USED? ARE THERE DIFFERENCES?

WHAT ABOUT PHYSICAL IDENTIFICATION AND SECURITY?

- Tagging?
- Cages?
- Stamping?
- Storage bays?

PRODUCT ENGINEERING

DOES ENGINEERING

- Control and assign part numbers?
- How?

DOES ENGINEERING INITIALIZE AND CONTROL

BILL-OF-MATERIAL RECORDS? HOW?

DOES ENGINEERING (ECN) INITIALIZE AND CONTROL ENGINEERING

CHANGE NOTICES? HOW? HOW MANY HAVE BEEN ISSUED LAST
12 MONTHS?

WHAT IS THE CRITERIA FOR MAKING AN ECN EFFECTIVE?

WHAT IS THE INFORMATION FLOW BETWEEN ENGINEERING AND

- PICS
- Data processing
- Industrial engineering
- Purchasing
- The factory

PROCUREMENT

HOW IS THE FUNCTION ORGANIZED?

- By commodity?
- How many buyers?
- How is buying responsibility assigned?
- Skill and experience levels?
- Is subcontract separate?

WHAT IS INFORMATION FLOW BETWEEN PROCUREMENT AND

- PICS?
- Product engineering?
- Quality assurance?
- Accounting?
- Top management?
- Vendors?
- Government agencies?

PROCUREMENT (Cont'd.)

WHAT TECHNIQUES ARE USED TO ACHIEVE SATISFACTORY
PERFORMANCE

- Vendor performance analysis, considering
 - . Delivery reliability
 - . Quality
 - . Price competitiveness
- Expediting
- Lead time

WHAT PURCHASING FORMS AND RECORDS ARE USED? COLLECT
WORKING SAMPLE OF EACH.

- CORRECTNESS?
- REGULARLY UPDATED?
- SUMMARIZED FOR MANAGEMENT?

WHAT MEASURES OF PURCHASING EFFECTIVENESS ARE
MAINTAINED?

COMPUTER SUPPORT (EDP)

WHAT ARE APPLICATIONS WHICH SUPPORT PICS?

WHAT ARE THEIR CHARACTERISTICS?

- Action oriented control reports
- After-the-fact history data
- Working documents such as:
 - . Schedules
 - . Labor tickets
 - . Bill-of-material records
 - . Process route sheets

IS EDP SUPPORT

- Timely - Accurate - Complete

WHAT PORTION OF EDP CAPABILITY IS COMMITTED TO
PICS? IS THERE CAPACITY FOR ADDITIONAL WORK?

ARE EXISTING APPLICATIONS EFFICIENT?

- Do they use current software?
- Do they make best use of hardware?

ARE APPLICATIONS

- Batched
- On-line

ARE CRT's BEING USED EFFECTIVELY?

DOCUMENTATION (INFORMATION SYSTEMS)

PARTS NUMBERING SYSTEMS

- How many?
- What are their characteristics?
- Can they be combined? Streamlined?
- Are they flexible? Expandable?
- Who is responsible for maintenance?

BILL-OF-MATERIAL RECORDS

- What type?
 - . Summary
 - . Detailed
 - . Indented
 - . Modular
- How many levels?
- How handled on computer
 - . Retrieval
 - . Exploded
 - . Chained
 - . Where-used
- WHAT ABOUT MAINTENANCE
 - . Responsibility . Timeliness
 - . Input/output

DOCUMENTATION (INFORMATION SYSTEMS) (Cont'd.)

PROCESS ROUTINGS

- What is their data content?
- How coded?
- How cross-referenced with B/M records?
- Maintenance
 - . Responsibility
 - . Timeliness
 - . Input/output

DATA BASE (COMPUTER)

- Files
 - . How many? . How large? . How stored?
- Files management and maintenance
 - . What system is used?
 - . Are files current?
- Are files flexible?
- Is data needed which is not now in the files?
What is it needed for?
 - . Is this data available
 - . What must be done to get it?
 - . Can present file structure and organization
accommodate added data?

DOCUMENTATION (INFORMATION SYSTEMS) (Cont'd.)

- Does the overall approach to the data base appear to be
 - . Efficient?
 - . Suited to requirements?
 - . Suited to available capabilities?

RECEIVING

ARE ALL RECEIPTS WRITTEN UP THE DAY RECEIVED?

WHAT IS THE CRITERIA FOR REJECTING A SHIPMENT? WHAT
ACTION FOLLOWS A REJECTION?

- How is material routed from Receiving to next work station? What are next work stations?
- Ascertain how the Inventory Control Record is updated from Receiving data.
- Ascertain volumes of receipts average...receivers, lines, rejects, et al.
- Are items on Shortage List highlighted? What action is taken on an item identified as short?

INSPECTION - INBOUND

DOCUMENT FLOW OF MATERIAL TO INSPECTIONS?

WHAT IS SEQUENCE OF PERFORMING INSPECTION? FIFO?

OTHER?

DETERMINE OAVERAGE DURATION OF A LOT IN INSPECTION?

ASCERTAIN WHAT IS DONE IF PARTS OR LOT FAILS INSPECTION.

HOW ARE PARTS DIRECTED FROM INSPECTION TO NEXT STATION?

CATALOG REPORTS ASSOCIATED WITH INVENTORY NECESSARY
FOR INSPECTION.

QUALITY CONTROL

ASCERTAIN WHERE QUALITY CONTROL CHECKS OCCUR IN CYCLE.

DETERMINE VARIOUS CATEGORIES OF REJECTION.

WHAT IS STATUS OF PARTS OR MANUFACTURING AS TO
PRODUCTIOIN SCHEDULING AND INVENTORY CONTROL WHEN A
PART IS DETAINED FOR QUALITY PROBLEMS.

DETERMINE DISPOSITIONS OF PARTS FROM QUALITY DETAINMENT.

DETAIL INVENTORY CONTROL TRANSACTIONS THAT ARE CAUSED
OR AFFECTED BY Q.C. ASSOCIATED INTERVENTION.

PRODUCTION CONTROL SOFTWARE

PACKAGE VENDOR

QUESTIONNAIRE

NOVEMBER 26, 1980

TABLE OF CONTENTS

<u>Title</u>	<u>Page</u>
INTRODUCTION	3
OUR CLIENT BACKGROUND	4
QUESTIONNAIRE	
General Information	7
Master Scheduling	13
Materials Requirements Planning	15
Capacity Requirements Planning	19
Shop Floor Scheduling (Dispatching)	23
Operations Tracking	25
Performance Monitoring	27
Standard Costing	28
Inventory Management and Control	29
Bill of Material Structure and Maintenance	31
Process/Routing Structure and Maintenance	32
Purchasing	34
Simulation	35

INTRODUCTION

This questionnaire will be used to screen potential candidate production control software packages.

The top 6 - 10 packages will be selected for more detailed analysis. During this detailed analysis, any package will be immediately disqualified if information in this questionnaire is inaccurate.

Where your package does not now have a feature or capability you must so state. But if it can be upgraded to meet the requirement, then describe the systems logic and programming changes needed. An estimated cost (plus or minus 25%) should accompany descriptions of any programming changes.

If you require additional space to answer any questions, please attach additional pages to the questionnaire and reference the section and question number.

Where your response may be subject to negotiation, indicate this.

BACKGROUND

Our client manufactures and rebuilds equipment costing millions of dollars per unit.

Manufacturing is per customer order, although final assembly is often rescheduled based on order release date. The most critical material scheduling is to the major subassembly and option level. This makes it necessary to Master Schedule at two levels.

Rebuilding and refitting existing units is a significant factor in materials planning and work scheduling. Not only is the bill of material (BOM) based on statistical forecasts of part replacement need, but the routing is dependent on test results. Therefore, planning is based on:

1. A forecasted BOM which can contain less than one unit of measure; e.g., 1 parent needs 0.2 components. This would indicate that 20% of the time that component is needed on the rebuilt unit.

2. A most likely routing for rebuilt units would be used for Capacity Requirements planning. Another possibility is a decision tree routing with statistical branch loading.

Shop Floor Scheduling and Operations Tracking for rebuilding and refitting must be closely linked. Because both the actual material requirements and the actual routing are determined while work is in-process, it is imperative that materials needs and routing changes be fed back to Shop Floor Scheduling as rapidly as possible. It is likely that these changes will be the major

impetus for material expediting and work rescheduling.

Materials have purchase lead times of up to three years and manufacture can take another two years; therefore, the planning horizon must be at least five years out. Yet Capacity Requirements Planning and Shop Floor Scheduling must provide information by shift and day.

Tools, test equipment, and supplies are required for work at a specific work center, and must be requisitioned to relate to a routing sheet task performed at a work center and used for a specified time.

Preventative maintenance (P.M.) work is conducted on work centers and uses operations personnel. This P.M. work must be scheduled into both Capacity Requirements Planning and Shop Floor Scheduling. In addition, P.M. work will also need scheduling of tools, test equipment, and supplies requisitions.

Our client's products are in a rapidly changing technology. This places heavy demands on both Bill of Material Maintenance and Routing Maintenance. Not only are there hundreds of engineering change notices (ECNs) each month, but at a single time there may be many ECNs with differing effective dates. Some ECNs may represent planned but not yet authorized changes.

Many subassemblies are interdependent. That is, because of custom fitting and parallel testing, the scheduling of shop orders becomes constrained by interdependencies. These constraints

can best be related by a PERT or CPM network. Capacity Requirements Planning and Shop Floor Scheduling should be able to work within these constraints.

Shop Floor Scheduling should be able to develop a Daily Dispatch Schedule, hour by hour for up to five days out and shift by shift for six weeks out.

Prior to release of a shop order to the production floor the Shop Floor Scheduling module should check if inventory, tools, test equipment and supplies are on-hand, and check if labor skills are available to be assigned. Any exceptions initiate expediting procedures.

Operations Tracking will accumulate detailed transaction data. Any significant deviations from plan must be immediately brought to the attention of the Shop Floor Scheduler.

Performance monitoring will feedback actual versus plan or standard performance.

Inventory is in multiple locations and has many serial numbered parts. Multiple location control requires a location subsystem for inventory control. Serialization of parts complicates the location system and serialized parts must be capable of being tracked to the final product.

Planning activities will be performed at the head office, which is some thousand miles from each manufacturing site.

GENERAL INFORMATION

1. What is your software package name(s)? _____
2. What is your company name? _____
3. Who is our marketing contact? Name _____
Title _____
Address _____

Telephone _____
4. Who is our technical contact? Name _____
Title _____
Address _____

Telephone _____
5. What was the date of your first installation? _____
6. How many installations do you have? _____
7. How many class "A" installations do you have? _____

Note: Class "A" installations would be your customers who have successfully installed all the major production control modules.

E.g., Forecasting.
Master Scheduling.
Materials Requirements Planning.
Capacity Requirements Planning.
Shop Floor Scheduling and Control.
Performance Reporting.
Standard Costing.
Bill of Material File Maintenance.
Routing File Maintenance.
Inventory Control.

8. Name six class "A" users of your software.

Note: If your package does not contain all modules, state the ones not included.

A. Name _____

Address _____

Contact _____

Telephone _____

B. Name _____

Address _____

Contact _____

Telephone _____

C. Name _____

Address _____

Contact _____

Telephone _____

D. Name _____

Address _____

Contact _____

Telephone _____

E. Name _____
Address _____

Contact _____
Telephone _____

F. Name _____
Address _____

Contact _____
Telephone _____

Note: Kearney may wish to contact some of these
class "A" users. If so, we will set up these
contacts through your marketing contact.

9. Has your package been rewritten since the first installation?

_____ When? _____

Why? _____

10. What is the price of your package?

Purchase _____ Lease _____

11. Do you provide software maintenance for the package? _____

At what cost? _____

12. What hardware does your system run on?

- a. Manufacturer _____
Operating Systems _____ Model _____
- b. Manufacturer _____
Operating Systems _____ Model _____
- c. Manufacturer _____
Operating System _____ Model _____

Note: These hardware should be capable of supporting class "A" users. State exceptions.

13. What data base management systems support your package?

- a. _____
- b. _____
- c. _____

Attach application data base schema overview for each.

14. What level software support to you provide for each of the following:

- a. Systems Engineering _____

At what cost? _____

- b. Data Base Engineering _____

At what cost? _____

- c. Programming Support _____

At what cost? _____

d. Implementation Support _____

At what cost? _____

15. What programming language(s) is used?

16. Do you provide users with high level (source) program code?

17. Do you allow program and data base modifications?

Are there limitations to these allowable modifications?

What are they? _____

18. How many programs are in the package?

19. What documentation is available to users?

Systems _____

Programming _____

Operator _____

User _____

Implementation guides _____

20. Is your software package:

- a. Regenerative? _____
- b. Net Change? _____
- c. Both Net Change and Regenerative combined? _____

- d. Bucketed? _____ What Maximum? _____
- e. Bucketless? _____
- f. Batch? _____
- g. On-line? _____
- h. Combination of batch and on-line? _____
- i. Distributed processing? _____

21. Are detail transaction history reports produced for each transaction within each processing module? _____

22. Are transaction audit trails maintained? _____

MASTER SCHEDULING

1. Does your package use a Master Scheduling module to interpret sales forecasts into a production plan? _____
 2. Is this Master Scheduling module separate from the Materials Requirements Planning module? _____
 3. Is your Master Scheduling module capable of scheduling at two levels? _____ For example,
 - a. Finished product.
 - b. Major subassemblies and options.
 4. When Master Scheduling for subassemblies and options, does the time phasing reflect final assembly lead times? _____
 5. Can inventory and planned production be allocated to subassembly and option requirements? _____
- How? _____

6. If planned production (Shop or Purchase Order) is allocated to a requirement, does the shop order get rescheduled to match the requirement date? _____
 7. Can rescheduling be suppressed and expedite notices produced instead? _____
 8. Are planned orders rescheduled and are expedite notices produced for work-in-process? _____
 9. Can Shop or Purchase Orders be pegged to their requirements? _____

10. Does your Master Scheduling module produce a Gross Capacity Plan from the Master Schedule? _____

What capacities are projected? _____

11. Does your Master Scheduling module produce Operations Budget projections? _____

What cost elements are Budgeted? _____

MATERIALS REQUIREMENTS PLANNING

1. Does your package use a Materials Requirements Planning module to translate the Master Schedule (production plan) into gross material requirements for all stages of manufacture and for new materials? And does it then net these gross requirements against inventory on hand to give net material requirements? And does it back schedule requirements based on manufacturing cycle times? _____ If no, explain how materials planning is accomplished. _____
- _____
- _____
- _____

2. Does the module handle a two-level Master Schedule? _____

3. Does this module use a multiple-level Bill of Materials? _____

_____ What is the maximum number of levels? _____

4. Does this module use a low-level code to determine if there are not more item requirements at lower levels of the Bills of Material? _____ If not, how is this achieved? _____
- _____
- _____
- _____

5. Will this module perform explosions and netting from Bills of Material containing fractional unit of measure relationships of component to parent? _____

What customer of yours does this? _____

6. Does this module's explosion and netting logic allow pseudo Bills of Material for items having a logical break in the manufacturing process but which are not stocked in inventory?

How is this accomplished? _____

What customer of yours does this? _____

7. Are net requirements translated into manufacturing and purchase orders? _____ Do these manufacturing and purchase orders reflect inventory, manufacturing and purchase policies such as lot sizes and safety stocks? _____

8. Does this module's netting logic have component substitution logic? _____

How is this accomplished? _____

What customer of yours does this? _____

9. Can temporary or one-time manual overrides be simply done to:

a. Substitute a component? _____

b. Add or delete a component? _____

c. Change the manufacturing cycle time? _____

d. Change lot size policies? _____

e. Create artificial requirements? _____

10. Are there different classes of manufacturing and purchase orders? _____

E.g., a. Planned or Recommended Orders? _____

b. Firm Orders which the system does not reschedule? _____

c. Released Orders which are already work-in-process? _____

11. If regenerative, does this module regenerate Planned Orders but only produce schedule exception notices for Firm and Released Orders? _____

12. Does this module allocate or reserve inventory against requirements? _____ And does it also allocate anticipated inventory receipts to requirements? _____

Is this allocation achieved through pegging component manufacturing and purchase orders to the parent manufacturing or purchase orders? _____

If not, how is allocation achieved? _____

13. Does this module produce exception message reports? _____

For expediting and deexpediting? _____

For manual overrides made? _____

For orders having no requirements? _____

Others? (specify) _____

14. Does this module omit rescheduling within a user-specified
time tolerance? _____

CAPACITY REQUIREMENTS PLANNING

1. Does your package use a Capacity Requirements Planning module to interpret manufacturing orders into production work center work load demands? _____
2. Does this module do finite capacity loading of work centers? _____
If yes, is rescheduling automatic? _____
Or can the system recommend rescheduling for manual action? _____
3. Is it necessary to run both Materials Requirements Planning and Capacity Requirement Planning together to accomplish re-scheduling? _____ Or can each run independently with changes to the other module incorporated in the next scheduled run of that module? _____
4. Is this module capable of net change logic? _____
Is it linked to Material Requirements Planning net change logic? _____
5. Does this module schedule in bucketed time periods? _____
6. Is this module capable of labor skill capacity loading as well as work center work loading? _____
How is this accomplished? _____

What customer of yours does this? _____

7. Does this module schedule tools and support equipment requirements? _____ If yes, does the schedule identify the item and time required? _____
If no, how is this scheduling accomplished? _____

8. Does this module incorporate preventative maintenance into capacity planning? _____ How is this accomplished? _____

9. Is this module capable of scheduling work for non-material driven activities? _____
E.g. Work center maintenance? _____
Labor skill training? _____
Support equipment maintenance? _____
10. How does this module handle deviations from the normal routing for:
 - a. Rework? _____

 - b. Alternative routings? _____

c. Additional Operations? _____

d. Extended time in an operation? _____

e. Optional routings or decision point (tree structured)
routings? _____

11. If deviations from the normal routing require rescheduling,
how are Materials Requirements Planning and Capacity Require-
ments Planning adjusted? _____

12. Does this module support on-line interactive schedule adjust-
ments? _____ Does it link all manufacturing order
operations to the work center to which they are scheduled?

_____ Does it use net-change logic to identify
the total capacity, schedule and materials impacts of any
changes? _____

13. Does this module support a bill of work, which relates all
routings and operations to a network related to the finished

product? _____

Note: This would be a PERT or CPM network linking routings together, and defining the interrelationships of routings. For example, two parts may be interdependent because of custom fitting needs, but the actual routing may require one part to go through many other levels of assembly prior to the final fitting.

14. Is there a PERT or CPM capability in this package? _____

SHOP FLOOR SCHEDULING (DISPATCHING)

1. Does your package have a Shop Floor Scheduling (Dispatching) module capable of scheduling work to the production floor, by hour for five days, and by shift for six weeks? _____
If not, what is the Dispatch Schedule time horizon? _____
2. Is this module capable of operating in a distributed processing mode with daily updates to and from the main system? _____
3. Does this module operate in an on-line interactive mode? _____

4. Does this module make prerelease job requirements checks on:
 - a. Inventory on hand? _____
 - b. Tools availability? _____
 - c. Labor skills availability? _____Are exception reports produced if any requirements are not met?

5. Does this module use a priority logic to give preference to one order over another? _____
6. Does actual operations performance feedback from the shop floor automatically trigger exception messages to the dispatcher where rescheduling may be necessary? _____
7. Does this module use net change logic to identify the impact of any schedule change? _____
8. Does this module release job documents to the floor, such as:
 - a. Routing and process information? _____
 - b. Labor tickets? _____

c. Materials requisitions? _____

d. Supplies requisitions? _____

e. Tools requisitions? _____

9. Does this module maintain job status information for all work-in-process and orders held for late requirements? _____

OPERATIONS TRACKING

1. Does your package monitor work-in-process by logging actual transaction activity against each manufacturing order and operation within that order? _____
 Is this an on-line data entry activity? _____
 Or is it both on-line and batch data entry? _____
2. Does this module maintain detail transaction information on disk until the related manufacturing order is closed out?
 _____ Does this transaction information include:
 - (a) Materials released to the order? _____
 - (b) Exception or additional materials released? _____
 - (c) Tools used by the amount of time? _____
 - (d) Supplies used if related to a manufacturing order? _____
 - (e) Rework operations? _____
 - (f) Alternate routings? _____
 - (g) Operations appended to routings? _____
 - (h) Labor time by skill and operation? _____
3. Does this module produce exception reports if actual performance is not what was expected? _____ Such as:
 - (a) Unplanned materials usage? _____
 - (b) Materials not released that should have been? _____
 - (c) Late operations? _____
 - (d) Missed operations? _____
 - (e) Additional or unplanned operations? _____
 - (f) Labor skills over plan? _____

g. Wrong labor skill? _____

4. Does this module perpetually update or maintain job status based on transaction data as it is received? _____

PERFORMANCE MONITORING

1. Does your package produce performances reports? _____
Are these reports daily? _____ Weekly? _____
Monthly? _____ Are they also produced to summarize
manufacturing order performance when it is closed? _____
2. Do these performance reports include:
 - a. Labor Productivity? _____
 - b. Work Center Capacity Utilization? _____
 - c. Schedule Performance? _____
 - d. Cost Variance Reports? _____
 - e. Exception Summaries? _____
3. Are detailed transactions data summarized but maintained on
disk after the manufacturing order is closed? _____
Do these summarized data assume plan and include only
exceptions to plan? _____ e.g., Exception
routings or operations, exception materials.
4. Does this performance information interface with an Operations
Budgeting module of your package? _____

STANDARD COSTING

1. Does your package have Standard Costing? _____
2. Does this standard costing include:
 - a. Materials? _____
 - b. Labor by operations? _____
 - c. Supplies? _____
 - d. Tools or Equipment Usage? _____

INVENTORY MANAGEMENT AND CONTROL

1. Does your package have an inventory control module which:
 - a. Records all receipts and disbursements of stock? _____
 - b. Has a locator system to track movement and physical location of stock within the inventory area? _____
 - c. Has holding area locations such as inspection or repair stations which may be excluded from available inventory allocations? _____
 - d. Produces daily detailed transaction activity reports? _____
 - e. Summarizes detail transaction activity by stock keeping unit on a weekly basis? _____
 - f. Has a cycle counting submodule which:
 - Uses a two-step cycle counting procedure? _____
 - Can trigger cycle counts by item, by time since last count, and by section of the inventory stocking area? _____
 - g. Has inventory policy features such as:
 - Lot sizes (e.g., EOQs)? _____
 - Specific Requirement Reorder Method? _____
 - Minimum/Maximum Reorder Method? _____
 - Two-Bin Reorder Method? _____
 - Safety Stock Lead Time Coverage? _____
2. Is this module capable of operating in a distributed processing mode with daily updates to and from the main system? _____

3. Does this module have on-line inventory inquiry capabilities? _____
Does it also have on-line update capabilities? _____

4. Is this module able to handle serialized parts as well as a location system? _____

Note: Serialized parts have a unique serial number and must be tracked throughout the system to the end product.

5. Does this module use an empty location transaction to identify potential inventory errors? _____

Note: Empty location transactions would indicate to the system that there should be no item assigned to that location. The system would also expect an empty location transaction when it allocates the last item in a location.

6. Does this module produce exception reports? _____

Do they include:

- a. Zero inventory balances? _____
- b. Over maximum balances? _____
- c. No movement items? _____
- d. No movement locations? _____
- e. Not in assigned location items? _____
- f. Others (specify)? _____

7. Does this module track items which are at outside vendors for special processing? _____

8. Does this module chain inventory items to:

- a. All requirements? _____
- b. All manufacturing or purchase orders? _____

BILL OF MATERIALS STRUCTURE AND MANAGEMENT

1. Does your package have a Bill of Materials Structure and Management module which does the following?
 - a. Records parent component relationships? _____
 - b. Control engineering change notices (ECNs) by:
 - Date effectivity? _____
 - Inventory depletion effectivity? _____
 - Production model run effectivity? _____
 - c. Control ECN status by:
 - Planned ECNs not approved? _____
 - Approved ECNs by effectivity? _____
 - Active ECN? _____
 - Old effectivity ECN? _____
 - d. Maintains where-used item to parent chains? _____
 2. Does this module report all planned work, work-in-process and inventory affected by an ECN extended into the Bill of Materials? _____
 3. Does this module have the capability to maintain both a Planning Bill of Material (BOM) and an Operations Bill of Material for the same item? _____
- Note: Rebuilt products have a forecasted BOM for planning but when the order is released to manufacturing the actual materials required will be less than the planning BOM. Additional materials may be required as work is in-process.
4. Does this module have the capability to maintain a temporary or amended BOM to reflect actual materials usage if different from the recorded BOM? _____

PROCESS/ROUTING STRUCTURE AND MAINTENANCE

1. Does your package have a Process/Routing Structure and Maintenance module which does the following?
 - a. Records each operation needed to process materials to become the parent item of the manufacturing order? _____
 - b. Identify labor category and skill required to complete each operation? _____
 - c. Identify the standard time required to complete the operation for that skill? _____
 - d. Identify tools and equipment required to support each operation? _____
 - e. Control methods engineering change notices (ECNs) by:
 - Date effectivity? _____
 - Production model run effectivity? _____
 - f. Control ECN status by:
 - Planned ECNs not approved? _____
 - Approved ECNs by effectivity? _____
 - Active ECNs? _____
 - Old effectivity ECNs? _____
 - g. Identify the work center where each operation is performed? _____
 - h. Maintain work center where-used structure identifying each operation which can be performed at specific work center? _____

i. Maintain alternate routings for potential rescheduling?

2. Does this module support processes which do not relate to manufacturing orders? _____

Note: Preventative maintenance processes using work centers, tools and labor shared with manufacturing is this type of a process.

3. Does this module report all planned work and work-in-process affected by an ECN entered into the Routing File? _____
4. Does this module have the ability to append optional operations to the standard routing? _____

Can routings be combined to form one major routing for one manufacturing order? _____

How is this achieved? _____

PURCHASING

1. Does this package have a purchasing module? _____
2. Does it have the following features?
 - a. Planned and open purchase order status reporting? _____
 - b. Milestone follow-up notice management? _____
 - c. Receiving interface to open purchase orders? _____
 - d. Vendor performance analysis? _____

SIMULATION

1. Does this package have simulation capabilities? _____
How is this achieved? _____

2. Does this module simulate the time phased net material re-
quirement? _____
3. Does this module simulate the work center capacity loads?

4. Does this module simulate the manpower/labor skill loading?



DICTIONARY

FOURTH EDITION

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Preface

Historical Perspective

The following is taken from the Preface to the preceding (third) edition of the APICS Dictionary, Richard C. Sherrill, Editor. It is included here for the historical perspective it gives.

"Since its founding thirteen years ago, APICS has constantly strived to assist those involved in the production and inventory control field. One of the primary problems encountered in the early days of the emerging field was the lack of a common language by which practitioners could communicate. Terminology varies greatly between companies; consequently it was difficult to share information and techniques. It was for the purpose of attacking this problem that work was begun on the first edition of this Dictionary in 1961. Because of the scope of the task, the effort involved in gathering and defining the original terms was tremendous. Representatives of more than two-thirds of the then existing chapters participated. Under the editorship of Dr. Clifford M. Baumbach, the work of these APICS members led to the publication of the first Dictionary in 1963.

Even when the first edition was published, it was recognized that there would need to be continuous effort to maintain a dictionary which satisfied the current technical language needs of the practitioner and researcher. Along this line, Mr. Oliver W. Wight undertook the development of the Second Edition in 1963. With the addition of the basic computer terms the total number of entries was more than doubled.

The approach to the development of the Third Edition has been to evaluate potential additions and alterations in relation to the role of the Dictionary as an educational tool as well as a reference guide. From the educational aspect, the user may be seeking a broader understanding than can be obtained from a single definition. For this reason the cross referencing between terms, both similar and contrasting, has been greatly increased. The purpose of these references is to form groups of connected terms. The user can start with any of the several terms in a group and be directed to the others. It is hoped that this will allow the user to refer quickly to several terms related to his particular area of interest.

The revisions of the Dictionary related to its role as a reference booklet were of four types. First there are the new terms which have gained prominent usage since the Second Edition was printed. Secondly, the constantly growing influence of operations research and data processing necessitate the inclusion of additional terms for those fields. Thirdly, because of the interaction among costs, costing methods and production control decisions, a limited number of cost accounting terms have been added. Finally, the computer terms have been merged with the rest of the definitions to facilitate easier usage."

The Fourth Edition

This fourth edition of the APICS Dictionary has been expanded even further. The number of definitions included is substantially larger than in prior editions, even though many obsolete terms have been dropped. Moreover, certain terms from the purchasing field have been included, in recognition of the evergrowing interrelationship and interdependence of the various logistics functions within manufacturing and distribution organizations.

Further, and of even greater significance, is the enormous progress which has been made in the field of production and inventory management over the last ten years. There has been a revolution in the field during this period. Today we are the possessors of an organized and coherent body of knowledge, most of which simply didn't exist ten years ago, and which is based on valid, widely-recognized principles consistent with the realities of life in a manufacturing organization.

We are hopeful that this edition of the APICS Dictionary will mark the emergence of a truly standardized set of terminology in production and inventory management. We haven't had one up until now; terminology in this field has been largely fragmented, disjointed and imprecise despite the existence of prior editions of the APICS Dictionary. This is due, of course, to the fact that the field itself was disjointed, fragmented and imprecise. Now, however, given the existence of a body of knowledge which has coalesced, we believe that standardized terminology is a practical matter. We hope this publication assists materially in such a development, which would provide further impetus to the maturing process underway in production and inventory management.

"MRP"

Terminology in the field of production and inventory management has been both imprecise and unstable. Meanings of terms have changed over time, often causing great confusion. A good case in point, unfortunately, is the meaning of "MRP." Your editor has felt for some time that the most serious terminology problem in the entire field centers around the use of the term "MRP," and the imprecision surrounding it represents the greatest obstacle to achieving our goal of standardized, definitive terminology.

What we've been calling material requirements planning first evolved in the 1960's, but it didn't carry that label then. We called it "time-phased requirements planning" or "time series planning" or things like that. It's interesting to note that the third edition of the APICS Dictionary, published in 1970, didn't list "material requirements planning." Somewhere along the way, however, "material requirements planning" became widely used, and quickly became "MRP" in the verbal shorthand that we routinely employ in a technically complex world.

Initially, we viewed MRP (material requirements planning) as merely a better technique for releasing orders. We thought of it as nothing more than an inventory ordering technique, albeit a superior one. It wasn't long, however, before we realized that material requirements planning was much more than that. Due to its precision and its time-phasing, we found that MRP had the ability to evaluate orders already released and to detect when the due date of an order was out of phase with when it would be needed. MRP could tell us when to reschedule open orders. This was a major breakthrough, and MRP had become a scheduling tool—much more important to us than merely an inventory ordering technique.

The next major development was when we recognized that we really needed to get feedback from the plant and purchasing to be assured that the plans were in fact being executed. Capacity requirements planning techniques had become well accepted by this time and we found ourselves talking about "closed-loop MRP," which specifies a great deal more than material requirements planning: capacity planning and control, plant and vendor scheduling and feedback, master production scheduling, etc. The evolution of closed-loop MRP was a development of enormous significance. For the first time we had a complete system with which we could effectively plan and monitor factory and vendor operations.

Closed-loop MRP also paved the way for the next major development in the field: manufacturing resource planning. Manufacturing resource planning is all of closed-loop MRP and more: it includes direct tie-ins to financial and business planning; it is capable of reporting, at any level of detail, in dollars for financial control as well as in units for operational control; and it contains a simulation capability to test alternative plans and approaches. A handful of companies today are successfully utilizing manufacturing resource planning, and are reaping enormous benefits. It works, and in time it will become the standard for the management of a manufacturing company. Within this dictionary, therefore, are definitions for MRP (material requirements planning), closed-loop MRP, and manufacturing resource planning.

We're indeed fortunate to be where we are today in this field. We've learned so much in the last decade. No, we don't have all the answers but we do have many of them. We have tools that work, and we just couldn't say that ten years ago. To the extent that this dictionary achieves its goal of assisting in the development of standardized terminology, then to that extent it will be a success and our field will be enhanced. We solicit your support.

Thomas F. Wallace
Cincinnati, Ohio

Acknowledgements

This dictionary is the work of many people. In order to communicate more clearly their contributions, a few words may be in order regarding the organizational structure of the project team involved in the dictionary's development.

The scope of this publication has grown to such an extent where it's no longer a practical matter for only one or several individuals to cope with a major revision and reissue. Recognizing this at the onset, we elected to divide the total task into a number of functional categories and, having done that, to recruit the most competent and knowledgeable individuals we possibly could to head up each Category Group. The categories, and their leaders, are as follows:

<i>Category</i>	<i>Leader</i>
Master Production Scheduling	Walt Goddard Oliver Wight, Inc.
Material Requirements Planning	Jay Paul Xerox
Capacity Requirements Planning	Doug Hoelscher Tennant Company
Shop Floor Control	Bill Wassweiler MRM, Inc.
Purchasing	John Schorr Independent Consultant
Forecasting, Statistics & Operations Research	Dr. Tom Vollmann Indiana University
Inventory Management	Jack Durben Miles Laboratories
Data Processing	Bill O'Keefe Martin Marietta Data Systems
Industrial Engineering, Cost Accounting & Other	R.C. "Bing" Sherrill Moog, Inc.

The Editorial Review Board reviewed the definitions submitted by the Category Groups and made recommendations for additions, changes, deletions, etc. The Review Board members are:

Jim Burlingame	Luther Jenkins
Twin Disc	Rohm & Haas
Romeyn Everdell	Bing Sherrill
Rath & Strong	Moog, Inc.

Ollie Wight
Oliver Wight, Inc.

One of the positive developments within APICS recently has been the creation of the Process Industries Group. This group was well represented on the dictionary project. Luther Jenkins served as process industries advisor to the Editorial Review Board, and most Category Groups included at least one representative from the process industries.

The list below is intended to include all individuals who assisted on this project not already mentioned, either as members of a Category Team, as process industry representatives to a Category Team, or in other capacities. The Editor apologizes in advance for omissions, and asks that he be advised of any.

Jerry Allaire U.S. Shoe	M.J. Hablewitz Twin Disc	William McDonald IBM
James L. Allen, Ph.D. Miles Laboratories	Rich Heard Phillips Petroleum Company	Robert L. McKain Black & Decker
John D. Allison Quaker Oats	Al Herbert Tennant Company	Dave Moore Moog, Inc.
Dale M. Baker Miles Laboratories	Jerry Honeycutt American Cyanamid	Fred Ottem 3M Company
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Jack Gips R.D. Garwood, Inc.	Dick Ling Richard C. Ling, Inc.	Paul Waldron American Cyanamid
Joseph J. Gorfida Rockwell International	Dick Lingeman Honeywell	Kelly Woodruff Cincinnati Milacron

The Editor wishes to express his sincere thanks and that of the Society to each one of the individuals listed above.

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Dow Corning Corporation Midland, Michigan	Martin Marietta Data Systems Baltimore, Maryland

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Manufacturing Control—The Last Frontier for Profits, George W. Plossl, Reston Publishing Company, 1973.

Master Production Scheduling—Principles and Practice, William L. Berry, Thomas E. Vollmann and D. Clay Whybark, APICS, 1979.

Material Requirements Planning, Joseph Orlicky, McGraw-Hill Book Company, 1975.

Production and Inventory Control—Principles and Techniques, G.W. Plossl and O.W. Wight, Prentice-Hall, Inc., 1967.

Production and Inventory Control Handbook, James H. Greene, APICS, 1970.

Production and Inventory Management in the Computer Age, Oliver W. Wight, Cahners Books International, 1974.

A

ABC CLASSIFICATION—Classification of the items in an inventory in decreasing order of annual dollar volume. This array is then split into three classes, called A, B, and C. Class A contains the items with the highest annual dollar volume and receives the most attention. The medium Class B receives less attention, and Class C, which contains the low-dollar volume items, is controlled routinely. The ABC principle is, that effort saved through relaxed controls on low-value items will be applied to reduce inventories of high-value items. Syn: distribution by value.

ABC INVENTORY CONTROL—An inventory control approach based on the ABC classification.

ABORT—Abnormal termination of a computer program, caused by hardware or software malfunction or operator cancellation.

ABSOLUTE LANGUAGE—The language in which instructions must be given to the computer. The absolute language is determined when the computer is designed. Syn: machine language, machine code. (cf. symbolic language).

ABSORPTION COSTING—An inventory evaluation in which variable costs and a portion of the fixed costs are assigned to each unit of production. The fixed costs are usually allocated to units of output on the basis of direct labor hours, machine hours, or material costs. When a large portion of the unit cost in an absorption system is allocated, inaccuracies may develop particularly in comparisons between products. (cf. variable costing, inventory valuation).

ACCESS TIME—The amount of time that the computer takes to locate and transfer data from a storage device into primary storage. (cf. micro-second, nano-second).

ACCESSORY—A choice or feature offered to customer for customizing the end product. In many companies, this term means that the choice does not have to be specified prior to shipment but could in fact be added at a later date. In other companies, however, this choice must be made prior to shipment. (cf. attachment, option).

ACCUMULATION BIN—Where a product is assembled, this is usually a physical location used to accumulate all of the components that go into the assembly before sending the assembly order out to the assembly floor. Syn: kitting area, assembly bin.

ACCURACY—The degree of freedom from error, i.e. the degree of conformity to some standard. Accuracy is contrasted with precision. For example: four place numbers are less precise than six place numbers, however, a properly computed four place number might be more accurate than an improperly computed six place number.

ACKNOWLEDGEMENT—A communication by a vendor to advise a purchaser that a purchase order has been received and it usually implies acceptance of the order by the supplier.

ACQUISITION COST—See: ordering cost.

ACRONYM—A word formed from the first letter or letters of the words in a name term or phrase, for example: APICS, NASA, NEW (cf. mnemonic).

ACT OF GOD—A term used to denote an occurrence beyond control of avoidance by human power; any accident produced by a physical cause such as a fire, flood, earthquake, etc. It generally will not terminate a contract or discharge the parties, unless provided for in the agreement.

ACTION MESSAGE—An output of an MRP system that identifies the need for and the type of action to be taken to correct a current or a potential material coverage problem. Examples of action messages are "Release Order," "Reschedule In," "Reschedule Out," "Cancel" etc. (cf. exception report).

ACTIVE INVENTORY—Covers raw material-work-in-process, finished products which will be used or sold within the budgeted period without extra cost or loss.

ACTIVE LOAD—See: available work.

ACTIVITY RATIO—The ratio of the number of records in a file which have activity to the total number of records in the file.

ACTUAL COSTS—Those labor and material costs which are charged

against a job as it moves through the production process. (cf. standard costs).

ACTUAL COST SYSTEM—A cost system which historically collects costs as they are applied to the production, and allocates indirect costs based upon their specific costs and achieved volume. (cf. standard cost system).

ADAPTIVE SMOOTHING—An extension of Exponential Smoothing that includes the use of transcendental fitting functions (e.g. exponential and trigonometric functions). Alternatively, adaptive smoothing is a term applied to a form of exponential smoothing in which the smoothing constant is automatically adjusted as some function of forecast error measurement.

ADDRESS—An identifying number given to a particular data record so that it can be found in a computer storage device.

AGENT—A person acting for another who is authorized to perform or transact certain business for the other. In Purchasing, the person authorized to purchase goods and services for a company.

AGGREGATE FORECAST—An estimate of sales for some grouping of products, perhaps for all products produced by some manufacturing facility.

AGGREGATE INVENTORY—The sum of the inventory levels for individual items. For example, the aggregate finished goods inventory would be made up of one half the sum of all the lot sizes plus the sum of all of the safety stocks plus anticipation inventory plus transportation inventory (cf. base inventory level).

AGGREGATE INVENTORY MANAGEMENT—Specifically planning the overall levels of inventory that will be required and making sure that the individual replenishment techniques execute this overall policy.

ALGOL—Programming language designed for efficient expression of arithmetic and logical expressions, and control of logical processes.

ALGORITHM—A prescribed set of well defined rules or processes for the solution of a problem in a finite number of steps; for example, the full statement of the arithmetic procedure for calculating the lot size for one item.

ALLOCATION—1. In an MRP system, an allocated item is one for which a picking order has been released to the stock room but not yet sent out of the stock room. It is an "uncashed" stock room requisition. 2. A process used to distribute material in short supply. (cf. reservation).

ALLOCATION COSTING—See: absorption costing.

ALPHA—The smoothing constant applied to the most recent sales datum in exponential smoothing forecasting.

ALPHAMERIC—See: alphanumeric.

ALPHANUMERIC—Data that is both alphabetical and numeric.

ANALOG COMPUTER—A computer that solves a problem by operating on continuous data representing variables to simulate the behavior of the variables and their interrelationships. (cf. digital computer).

ANNUAL INVENTORY COUNT—See: physical inventory.

ANNUALIZED CONTRACTS—A method of acquiring materials which helps ensure continuous supply of material, minimizes forward commitments, and provides the supplier with estimated future requirements.

ANSI—American National Standard Institute, the U.S. government organization with responsibility for the development and promulgation of (among others) data processing standards.

ANTICIPATED DELAY REPORT—A regular report, normally issued by both Manufacturing and Purchasing to the material planning function, regarding jobs or purchase orders which will not be completed on time, why not, and when they will be completed. This is one essential ingredient of a closed-loop MRP system.

ANTICIPATION INVENTORIES—Additional inventory above basic pipeline stock to cover projected trends of increasing sales, planned sales promotion programs, seasonal fluctuations, plant shutdowns and vacations. (cf. base series).

APL—Problem-solving language for handling arrays and performing mathematical functions. Designed for use at remote terminals.

APPLICATION FUNCTION—The systems function of developing pro-

grams and systems to satisfy user needs. Syn: systems development function.

APPLICATION PACKAGE—A computer program or set of programs designed for a specific application (e.g., inventory control, linear programming, etc.). In many cases the programs in the application packages are necessarily written in a generalized way and will need to be modified to meet each user's own specific needs.

ARITHMETIC MEAN—See: mean.

ARRIVAL DATE—The date purchased material is due to arrive at the receiving site. Arrival Date can be input; can be equal to current due date; or can be calculated from ship date plus transit time. Syn: expected receipt date.

AS IS—A term indicating that goods offered for sale are without warranty or guarantee. The purchaser has no recourse on the vendor for quality or condition of the goods.

ASSEMBLE/TO-ORDER PRODUCT—See Make-To-Order Product.

ASSEMBLER—See: processor program.

ASSEMBLY—A group of subassemblies and/or parts which are put together; the total unit constitutes a major subdivision of the final product. When two or more components or subassemblies are put together by the application of labor or machine hours, it is called an assembly. An assembly may be an end item or a component of a higher level assembly. (cf. component, subassembly, intermediate).

ASSEMBLY BIN—See: accumulation bin.

ASSEMBLY LEADTIME—The time that normally elapses between the time a work order is issued to the assembly floor and its receipt into stock or shipping.

ASSEMBLY ORDER—A manufacturing order to an assembly or blending department authorizing it to put components together into an assembly or blend. Syn: blend order. (cf. fabrication order).

ASSEMBLY PARTS LIST—A list of all parts (may include subassemblies) comprising a particular assembly, as used in the manufacturing process. Syn: blend formula, mix ticket.

ASSIGNMENT—See: allocation.

ASYNCHRONOUS—Method of data communications transmission in which time intervals between transmitted characters may be of unequal length. Characters are synchronized by start and stop elements of differing length which occur at the beginning and end of each character.

ATTACHMENT—A choice or feature offered to customers for customizing the end product. In many companies, this term means that the choice, although not mandatory, must be selected prior to the final assembly schedule. In other companies, however, the choice need not be made at that time. (cf. accessory, option).

AUDIO RESPONSE—A computer output technique which is formatted from stored words previously recorded in the computer. Programmed instruction programs often communicate with the student through this technique.

AUTHORIZED DEVIATION—Permission for a supplier to manufacture a commodity that is not in conformance with the applicable drawings or specifications.

AUTOMATIC RESCHEDULING—Allowing the computer to automatically change due dates on scheduled receipts when it detects that due dates and required dates are out of phase. (cf. manual rescheduling).

AUXILIARY STORAGE—A supplementary magnetic storage media for data. Auxiliary computer storage can take the form of drum storage, disc storage, magnetic tape, etc.

AVAILABLE MATERIAL—A term usually interpreted to mean "material available for planning" and thus including not only the on hand inventory but also inventory on order. Material "available for use" would, of course, be only the material on hand which has not been assigned. (cf. reserved material).

AVAILABLE STOCK—See: Available Material.

AVAILABLE TO PROMISE—The uncommitted portion of a company's inventory or planned production. This figure is frequently calculated from the Master Production Schedule and is maintained as a tool for order promising.

AVAILABLE WORK—Work that is actually in a department ready to be worked on as opposed to scheduled work which may not yet be on hand.

AVERAGE FORECAST ERROR—The arithmetic mean of the forecast errors, or the exponentially smoothed forecast error (cf. forecast error, MAD).

AVERAGE INVENTORY—In a simple inventory system, this is the sum of one-half the lot sizes plus the reserve stock in formula calculations. Otherwise, just divide by twelve per inventory classification i.e., finished goods, WIP, or production material.

B

BACKLOG—All of the customer orders booked, i.e. received but not yet shipped. Sometimes referred to as "open orders" or the "order board."

BACKORDER—An unfilled customer order or commitment. It is an immediate (or past due) demand against an item whose inventory is insufficient to satisfy the demand. (cf. stockout).

BACKWARD SCHEDULING—A scheduling technique where the schedule is computed starting with the due date for the order and working backward to determine the required start date. This can generate negative times, thereby identifying where time must be made up. (cf. forward scheduling).

BALANCE-OF-STORES RECORD—A double-entry record system which shows at all times, in addition to the balance inventory items on hand (or perpetual inventory), the balances of material on order and "available" for future orders. Where a "reserve" system of materials control is used, the balance of material "on reserve" is also shown. (cf. reserved material).

BALANCED LOADING—Loading a starting department with a product mix that should not overload or underload subsequent departments.

BANK—A quantity of materials which is awaiting further processing. It can refer to raw materials, semi-finished stores or hold points, or a work backlog that is purposely maintained behind a work center.

BASE INDEX—See: base series.

BASE INVENTORY LEVEL—The normal aggregate inventory level made up of the aggregate lot size inventory plus the aggregate safety stock inventory but not taking into account the anticipation inventory which will result from the production plan. The base inventory level should be known before the production plan is made. (cf. aggregate inventory).

BASE PIPELINE STOCK—Inventory to fill the many stocking points in the distribution system. The flow time through the pipeline has a major effect on the amount of inventory required in the pipeline: e.g., if the average time for its passage through all distribution levels to the end user is ninety days, then the basic pipeline inventory must be on the average ninety days' supply. Time factors involved include order transmission, factory order processing, shipping, transportation, minimum-maximum inventory system, etc.

BASE SERIES—A standard series of demand-over-time observations used in forecasting seasonal items. This series of factors is usually based upon the relative level of demand during the corresponding period of previous years. The average value of the base series over a twelve month period will be 1.0. The base series is superimposed upon the average trend in demand for the item, for forecasting purposes. (cf. seasonal, adaptive smoothing). Syn: base index.

BASE STOCK SYSTEM—A fundamental method of inventory control which includes as special cases most of the systems in practice. In this system, when an order is received for any item it is used as a "picking ticket," and duplicate copies, called "replenishment orders," are sent back to all stages of production to initiate replenishment of stocks. Positive or negative orders called "base-stock orders" are also used from time to time to adjust the level of the base stock of each item. In actual practice, replenishment or-

- ders are usually accumulated when they are issued and are released at regular intervals. (cf. fixed interval reorder system).
- BASIC**—A common algebra-like high-level programming language, designed for use by non-professional programmers.
- BASIC PRODUCER**—The manufacturer that uses natural resources to produce materials for other manufacturing. A typical example is a steel company that processes iron ore and produces steel ingots. Others are those making wood pulp, glass and rubber. (cf. fabricator).
- BASIC STOCK**—See: base inventory level.
- BATCH CARD**—A document used in the process industries to authorize and control the production of a quantity of material. Batch size usually relates to vessel size or output in a specific time period. Batch card usually contains information such as quantity and lot number of ingredients to be used, processing condition variables, pack-out instructions and product disposition. (cf. fabrication order). Syn: mix ticket.
- BATCH PROCESSING**—A computer technique where transactions are accumulated and processed all at once or in a "batch." (cf. on line processing).
- BAYESIAN ANALYSIS**—Statistical analysis where uncertainty is incorporated, using all available information to choose among a number of alternative decisions. (cf. decision theory).
- BIAS**—The departure from a reference value of the average of a set of values. (cf. skew).
- BID**—A price, whether for payment or acceptance. A quotation specifically given to a prospective purchaser upon his request, usually in competition with other vendors.
- BILL OF CAPACITY**—See: product load profile.
- BILL OF LABOR**—See: product load profile.
- BILL OF LADING (UNIFORM)**—Abbreviation B/L or b/l. A carrier's contract and receipt for goods which it agrees to transport from one place to another and to deliver to a designated person or assigns for compensation and upon such conditions as are stated therein.
- BILL OF MATERIAL**—A listing of all the sub-assemblies, parts and raw materials that go into a parent assembly showing the quantity of each required to make an assembly. There are a variety of formats of Bill of Material, including Single Level bill of material, Indented bill of material, Modular (Planning) bill of material Transient bill of material, Matrix bill of material, Costed bill of material, etc.
- BILL OF MATERIAL PROCESSOR**—Refers to the computer applications supplied by many manufacturers for maintaining, updating, and retrieving bill of material information on direct access files.
- BILL OF MATERIAL STRUCTURING**—The process of organizing bills of material to perform specific functions. (cf. bill of material, planning bill, transient bill).
- BILL OF RESOURCES**—See: product load profile.
- BINARY CODED DECIMAL (BCD)**—A numbering system used in many computers where the basic binary system is used to represent decimal numbers.
- BINARY NUMBERING SYSTEM**—A numbering system using only the two symbols 0 and 1 which is especially well adapted to computer use since 0 and 1 can be represented as on and off or negative charges and positive charges. (cf. hexadecimal).
- BIN LOCATION FILE**—A file that specifically identifies the physical location where each item in inventory is stored.
- BIN RESERVE SYSTEM**—See: two bin system.
- BIN TAG**—A type of perpetual inventory, designed for storeskeeping purposes, maintained at the storage area for each inventory item. (cf. perpetual inventory record).
- BISYNCHRONOUS**—Data transmission in which synchronization of characters is controlled by timing signals generated at both the sending and receiving stations.
- BIT**—A binary digit. The basic unit of information with which the computer works. The bit can take the form of a magnetized spot, an electronic impulse, a positively charged magnetic core, etc. A number of bits together are used to represent a character in the computer. (cf. byte, word).
- BLANKET ORDER**—A long-term commitment to a vendor for material against which short-term releases will be generated to satisfy requirements.
- BLEND FORMULA**—See: assembly parts list.
- BLEND ORDER**—See: assembly order.
- BLENDING**—The process of physically mixing two or more lots of material to produce a homogenous lot. Blends normally receive new identification and require retesting.
- BLOCK CONTROL**—Control of the production progress groups or "blocks" of shop orders for products undergoing the same basic processes. (cf. flow control).
- BLOCK DIAGRAM**—A diagram in which a system or computer program is represented by annotated boxes and interconnecting lines. Syn: flow chart.
- BLOCK SCHEDULING**—This is a detailed scheduling technique where each operation is allowed a fairly long period or "block" of time such as a week. (cf. scheduling rules).
- BLOW-THROUGH**—See: transient bill of material.
- BOILER PLATE**—A term used to describe the terms and conditions on the back side of a purchase order.
- BOND (PERFORMANCE)**—A bond executed in connection with a contract and which secures the performance and fulfillment of all the undertakings, covenants, terms, conditions, and agreements contained in the contract.
- BOOK INVENTORY**—An accounting definition of inventory units or value obtained from perpetual inventory records rather than by actual count.
- BOOLEAN ALGEBRA**—Like ordinary algebra, it represents relationships and properties with symbols. However, Boolean Algebra also has classes, propositions, on-off circuit elements and operators: *and, or, not, except, if, then*. It is useful in defining the logic of a complex system.
- BOTTLENECK**—A facility, function, department, etc., that impedes production—for example, a machine or work center where jobs arrive at a faster rate than they leave.
- BOX-JENKINS MODELS**—A forecasting approach based on regression and moving average models, where the model is based not on regression of independent variables, but on past observations of the item to be forecast, at varying time lags, and on previous error values from forecasting.
- BRANCH AND BOUND**—Operations research models for determining optimal solutions based on the enumeration of subsets of possible solutions, which implicitly enumerate all possible solutions.
- BRANCH WAREHOUSE**—A separate stocking location removed from the main manufacturing plant typically carrying finished goods inventory or service parts. (cf. sku).
- BRANCH WAREHOUSE DEMAND**—See: warehouse demand.
- BRANCHING**—The function of a computer program which alters the logic path depending on some detected condition or data status. For example, the program would branch to a reorder routine when the projected available balance went negative.
- BREAK-EVEN CHART**—A graphical tool showing the total variable cost and fixed cost curve along with the total revenue (gross income) curve, both at all possible outputs. The point of intersection is defined as the break-even point, i.e., the point where revenues just equal costs. (cf. fixed costs; variable costs, total revenue).
- BREAK EVEN POINT**—The level of production or the volume of sales at which operations are neither profitable nor unprofitable. (cf. break even chart).
- BUCKETED SYSTEM**—An MRP system under which all time-phased data is displayed in accumulated time periods, or "buckets." If the period of accumulation would be one week, then the system would be said to have weekly buckets. (cf. bucketless system, time buckets, horizontal display, vertical display).
- BUCKETLESS SYSTEM**—An MRP system which all time-phased data is received, stored, processed and reported by specific dates and not in weekly (or larger) time buckets. (cf. bucketed system, time buckets, horizontal display, vertical display).
- BUDGET**—A plan which includes an estimate of future costs and reve-

nues related to expected activities. The budget serves as a pattern for and a control over future operations. (See flexible budget).

BUFFER—A storage area in the computer where data is held temporarily until the computer can process it.

BUFFER STOCK—See: decoupling inventory or safety stock.

BULK STORAGE—Large scale storage vessels for raw materials, intermediates or finished products in the process industries. Each vessel normally contains a mixture of lots and materials may be replenished and withdrawn for use or pack-out simultaneously.

BUSINESS CYCLE—A seemingly recurring change in general business activity going from a low point (depression) to a high point (prosperity). While called a "cycle" it is doubtful that extreme conditions recur with clocklike regularity. Understanding of cycles is important to forecasting. (cf. random variation, secular trend, seasonal).

BUSINESS PLAN—A statement of income projections, costs and profits usually accompanied by budgets and a projected balance sheet as well as a cash flow (source and application of funds) statement. It is usually stated in terms of dollars only. The business plan and the production plan, although frequently stated in different terms, should be in agreement with each other. (cf. manufacturing resource planning).

BUYER—An individual whose functions may include vendor selection, negotiation, order placement, vendor follow-up, measurement and control of vendor performance, value analysis, evaluation of new materials and processes, etc. In some companies, the functions of order placement and vendor follow-up are handled by the vendor scheduler. (cf. vendor scheduler).

BUYER CODE—A code used to identify the purchasing person responsible for a given item and/or purchase order.

BUYER/PLANNER—See: vendor scheduler.

BUYER'S MARKET—A "buyer's market" is considered to exist when goods can easily be secured and when the economic forces of business tend to cause goods to be priced at the purchaser's estimate of value.

BY-PRODUCT—A material of value produced as a side-stream of a production process. Ratio of by-product to primary product is usually fixed. By-products may be recycled, sold as is, or used for other purposes such as cleaning solvents. Syn: co-product

BYTE—Consists of 8 bits used to store two numeric or one alpha character. (cf. bit, word).

C

CAD/CAM—Computer Aided Design/Computer Aided Manufacturing. Two highly specialized technical applications of a computer to improve the productivity of the engineer.

CALENDAR TIME—Refers to the passage of days or weeks as in the definition of lead time or scheduling rules in contrast with running time. (cf. lead time, running time).

CANCELLATION CHARGES—A fee charged by a seller to cover his costs associated with a customer's cancellation of an order. If the seller has started any engineering work, purchased raw materials, or started any manufacturing operations, these changes would also be included in the cancellation charge.

CAPACITY—1. In a general sense, refers to an aggregated volume of workload. It is a separate concept from priority. (cf. priority, load).
2. The highest sustainable output rate which can be achieved with the current product specifications, product mix, work force, plant and equipment. (cf. efficiency).

CAPACITY CONTROL—The process of measuring production output and comparing it with the capacity requirements plan, determining if the variance exceeds preestablished limits, and taking corrective action to get back on plan if the limits are exceeded. (cf. input/output control, closed-loop MRP).

CAPACITY PLANNING—See capacity requirements planning.

CAPACITY REQUIREMENTS PLANNING (CRP)—The function of establishing, measuring, and adjusting limits or levels of capacity that are consistent with a production plan. The term capacity requirements planning in this context is the process of determining how much labor and machine resources are required to accomplish the tasks of production. Open shop orders, and planned orders in the MRP system, are input to CRP which "translates" these orders into hours of work by work center by time period: (cf. resource requirements planning, infinite loading, closed-loop MRP).

CAPACITY SMOOTHING—See: Load leveling.

CARD PUNCH—A machine that is used to punch holes into tabulating cards.

CARLOAD LOT—A shipment which qualifies for a reduced freight rate because it is greater than a specified minimum weight. Since carload rates usually include minimum rates per unit of volume, the higher LCL rate may be less expensive for a heavy but relatively small shipment.

CARRYING COST—Cost of carrying inventory, usually defined as a percent of the dollar value of inventory per unit of time (generally one year). Depends mainly on cost of capital invested as well as the costs of maintaining the inventory such as, taxes and insurance, obsolescence, spoilage, and space occupied. Such costs vary from 20–35% annually, depending on type of industry. (cf. economic order quantity, cost of capital).

CASCADED RECEIVING—A method of receiving material which allows delivery quantities to be applied to the oldest open delivery record and to successive delivery records until the quantity received is exhausted or the controlling purchase order quantity is satisfied.

CASCADED SYSTEMS—Multistorage operations; the input to each stage is the output of a preceding stage, thereby causing interdependencies among the stages.

CATALOG SEARCH—A computerized data retrieval technique involving the search of keywords stored as key nouns or characteristics of the product. A display shows all items from the data base with the specified keywords.

CAVEAT EMPTOR—"Let the buyer beware"—the purchase is at the buyer's risk.

CENTRAL PROCESSING UNIT—The main computer component that is made up of a control section and an arithmetic-logic section. The other basic units of a computer system are input-output units and primary storage.

CENTRALIZED DISPATCHING—Organization of the dispatching function into one central location. This often involves the use of data collection devices for communication between the centralized dispatching function, which usually reports to the Production Control Department, and the shop manufacturing departments. (cf. control center, decentralized dispatching).

CERTIFICATE OF COMPLIANCE—A supplier's certification to the effect that the supplies or services in question meet certain specified requirements.

CHANCE—Something which happens as a result of unknown or unconsidered forces. (cf. probability).

CHANGE ORDER—A formal notification that a purchase order or shop order must be changed in some form. This can either result from a changed date or specification by the customer, an engineering change, a change in inventory requirement date, etc. (cf. manufacturing order, engineering change, hold order).

CHANGE-OVER COST—The sum of the setup cost and the tear-down cost for a manufacturing operation. (cf. idle time). Syn: turn-around costs, shut-down/start-up costs.

CHANNEL—The device along which data flows between the input-output units of a computer and primary storage.

CHARACTER—An individual letter, numeral, etc. In computers, characters are made up of a number of bits.

CHECK BIT—The bit that is automatically added by the computer to an item of data when it is necessary to make it either even or odd parity. Syn: parity bit.

CHECK DIGIT—A digit added to each number in a coding system

which allows for detection of errors in the recording of the code numbers. Through the use of the check digit and a predetermined mathematical formula, recording errors such as digit reversal can be noted.

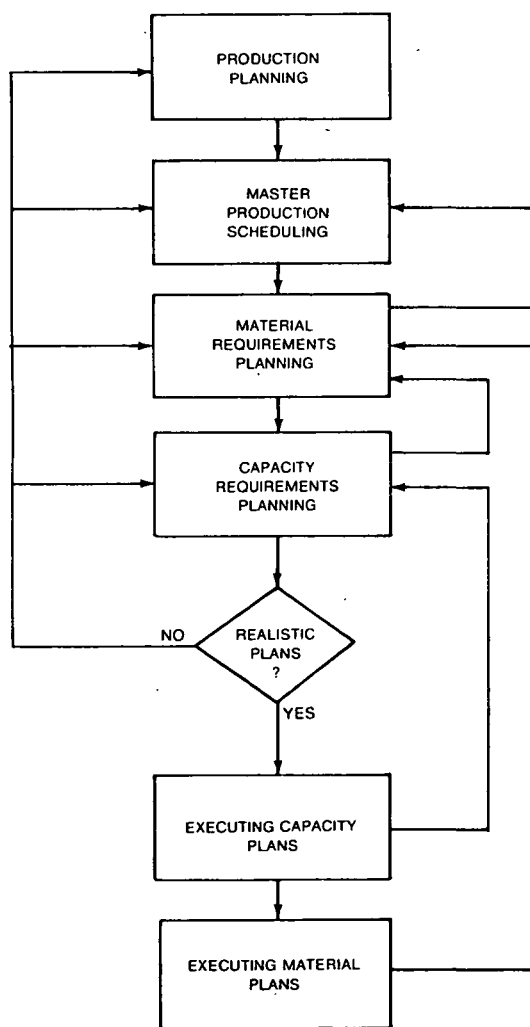
CHECKPOINT—Designated interval at which the status of a computer program is recorded, so that in event of program failure it can be restarted at some point other than the beginning.

C.I.F. (COST, INSURANCE, FREIGHT)—A freight term indicating that the seller is responsible for cost, the ocean marine insurance, and the freight charges on an ocean shipment of goods.

CLASSIFICATION—see: ABC classification.

CLOCK CARD—A form used to record attendance and/or time applied to various jobs. Syn: time card.

CLOSED LOOP MRP—A system built around MRP and also including the additional planning functions of Production Planning, Master Production Scheduling, and Capacity Requirements Planning. Further, once the planning phase is complete and the plans have been accepted as realistic and attainable, the execution functions come into play. These include the shop floor control functions of Input-Output measurement, detailed Scheduling and Dispatching, plus Anticipated Delay Reports from both the shop and vendors, Purchasing Follow-Up and Control, etc. The term "closed-loop" implies that not only is each of these elements included in the overall system but also that there is feedback from the execution functions so that the planning can be kept valid at all times. See diagram. (cf. manufacturing resource planning). For additional information, see Preface page iii: "MRP."



Closed-Loop MRP

COBOL—A common computer programming language that can be used with a number of computers. It is especially adapted to business and commercial problems. COBOL stands for *Common Business Oriented Language*. (cf. FORTRAN, RPG).

COLLATE—To compare and merge two or more similarly ordered sets of items into one ordered set. (cf. merge).

COMMODITY BUYING—Grouping like parts or materials under one buyers control for the procurement of all requirements to support production releases.

COMMON PARTS BILL (OF MATERIAL)—A type of planning bill which groups all common components for a product or family of products into one bill of material. (cf. planning bill, modular bill, super bill).

COMMUNICATIONS LINK—A method whereby a company with operations at different locations can send and receive data between them. (cf. telecommunication, microwave).

COMPETITIVE BIDDING—The offer of estimates by firms or individuals competing for a contract, privilege, or right to supply specified services or merchandise.

COMPONENT—An inclusive term used to identify a raw material, ingredient, part or subassembly that goes into a higher level assembly, compound or other item. May also include packaging materials for finished items. (cf. assembly, fabrication order, elemental parts).

COMPOSITE LEAD TIME—See: cumulative lead time.

COMPOSITE MANUFACTURING LEAD TIME—See: cumulative manufacturing lead time.

COMPUTER—A device capable of solving problems by accepting data, performing prescribed operations on the data, and supplying the results of these operations. (cf. analog computer, digital computer).

CONCENTRATOR—A device which merges many low-speed, asynchronous channels into one or more high-speed, synchronous channels to achieve economies of data transmission.

CONFIGURATION CONTROL—The function of ensuring that the product being built and shipped corresponds to the product ordered and designed. This means that the correct features, customer options and engineering changes have been incorporated.

CONFIRMING ORDER—A purchase order issued to a vendor, listing the goods or services and terms of an order placed verbally, or otherwise, in advance of the issuance of the usual purchase document.

CONSIGNEE STOCKS—Are inventories generally of finished products which are in the possession of customers, dealers, agents, etc., but remain the property of the manufacturer by agreement with those in possession.

CONSOLE—The control station of the computer with switches, lights, and other devices providing a means for the computer operator to communicate with the computer and vice versa. (cf. central processing unit).

CONSTANT—A quantity which has a fixed value. (cf. variable).

CONSTRAINT—A limitation placed on the maximization or minimization of an objective function. These usually result from scarcity of the resources necessary for attaining some objective. (cf. linear programming, non-linear programming, objective function). Syn: structural constraint, restriction.

CONTINUOUS PRODUCTION—A production system in which the productive units are organized and sequenced according to the steps to produce the product. The routing of the jobs is fixed and set ups are seldom changed. (cf. intermittent production).

CONTRACT—An agreement between two or more competent persons to perform or not to perform a specific act or acts. A contract may be verbal or written. A purchase order, when accepted by a vendor, becomes a contract. Acceptance may be in writing or by performance, unless the purchase order requires acceptance in writing.

CONTRACT DATE—The date when a contract is accepted by all parties.

CONTRIBUTION—The difference between sales price and variable costs. The remainder is used to cover fixed costs and profits.

CONTROL BOARD—A visual means of showing machine loading or project planning. Usually a variation of the basic Gantt chart.

CONTROL CENTER—In a centralized dispatching operation, the place at which the dispatching is done. (cf. centralized dispatching).

CONTROL CHART—Usually a large piece of graph paper used in the same manner as a control board. Where the Control board often uses strings and pegs or movable slips of paper to represent the plan and progress, the Control chart typically would be filled in pencil. (cf. Gantt chart).

CONTROL PROGRAM—A supervisory program which schedules and monitors the operation of resources under its control: these resources may be channels and their associated devices, communications lines and terminals, or user programs.

CONTROL SECTION—That section of the CPU that interprets instructions and directs the operation of all the other units of the computer system.

CONTROL UNIT—Intermediary device between peripheral devices and the computer channel which is responsible for initiating and reporting completion of device operations.

CONVERSATIONAL—Interactive program mode in which the program carries on a dialogue with a terminal user, generally leading him through a series of predefined operations without interruption.

CONVERTER—A manufacturer who changes the products of a basic producer into a variety of industrial and consumer products. An example is the firm that changes steel ingot into bar stock tubing or plate. Other converter products include paper, soap, and dyes. (cf. basic producer).

CORE STORAGE—See primary storage.

CORRECTIVE ACTION—Action that must be taken to get actual inventories, production, or quality back on plan, such as altering the number of people assigned to a particular department, changing overtime schedules, adjusting subcontract volume, or instructing employees in appropriate procedures.

CORRELATION—The relationship between two sets of numbers, such as between two quantities such that when one changes the other is likely to make a corresponding change. If the changes are in the same direction, there is positive correlation. When changes tend to go in opposite directions, there is negative correlation. (cf. scatter chart).

COST CENTER—The smallest segment of an organization for which costs are collected, such as the lathe department. The criteria in defining cost centers are that the cost be significant and the area of responsibility be clearly defined. A cost center may not be identical to a work center. Normally, it would encompass more than one work center. (cf. work center).

COST FACTORS—The units of input which represent costs to the manufacturing system, for example: labor hours, purchased material.

COST OF CAPITAL—Refers to the imputed cost of maintaining a dollar of capital invested for a certain period, normally one year. This cost is normally expressed as a percentage and may be based upon factors such as the average expected return on alternative investments and current bank interest rate for borrowing. (cf. economic order quantity).

COST-PLUS—A pricing method whereby the purchaser agrees to pay the vendor an amount determined by the costs incurred by the vendor to produce the goods and/or services purchased and to which costs are added a stated percentage or fixed sum.

COST REDUCTION—The act of lowering the cost of goods or services, by securing a lower price, etc. In cost reduction, the item usually isn't changed, but rather the circumstances around which the item is secured are changed, i.e., larger order quantity, versus value analysis in which the item is actually changed to produce a lower cost.

COSTED BILL OF MATERIAL—A form of bill of material which, besides providing the normal information such as components, quantity per, effectivity data etc., also extends the quantity per of every component in the bill by the cost of the components.

COSTING UNITS—The units of output to which costs are applied and in terms of which costs are expressed for example: cases of canned goods, 1,000's of bricks, tons of cement. (cf. cost factors).

COSTS OF CHANGING PRODUCTION RATE:—

Increasing Level—employee training; additional services or staff activity; extra shift costs; increased spoilage and rejections

Decreasing Level—unemployment insurance "bumping" charges; plant-community relations; idle time; material cancellation charges.

CPIM—Certified in Production and Inventory Management. A certification awarded by APICS.

CPIM*—Same as CPIM except * denotes fellow level.

CPM—Critical path method. See: critical path scheduling.

CPU—An abbreviation for central processing unit.

CRITICAL PATH METHOD (CPM)—A network planning technique used for planning and controlling the activities in a project. By showing each of these activities and their associated times, the "critical path" can be determined. The critical path identifies those elements that actually constrain the total time for the project. (cf. PERT)

CRITICAL RATIO—A dispatching rule which calculates a priority index number by dividing the time to due date remaining by the expected elapsed time to finish the job.

$$\frac{\text{Time Remaining}}{\text{Work Remaining}} = \frac{30}{40} = .75.$$

Typically ratios of less than 1.0 are behind, ratios greater than 1.0 are ahead, and a ratio of 1.0 is on schedule. (cf. dispatching rules, slack time rule).

CROSSFOOT—Adding fields of information horizontally, often done for checking purposes.

CROSS-SHIPMENT—Refers to the material flow activity whereby materials are shipped to customers from a secondary shipping point rather than from a preferred shipping point.

CRP—Abbreviation for capacity requirements planning.

CUMULATIVE BALANCE—An inventory record keeping technique where the inventory balance is not actually calculated with each transaction but instead is calculated as required. For example, a simple cumulative balance record would start out with the inventory level in one column; all disbursements would be added as they occur and all receipts would be added as they occur; to calculate the actual inventory balance at any time it would be necessary to find the difference between the cumulative disbursements and receipts and add or subtract this from the starting inventory. (cf. perpetual inventory record, cyclical count).

CUMULATIVE LEADTIME—The longest length of time involved to accomplish the activity in question. For any item planned through MRP it is found by reviewing each bill of material path below the item, and whichever path adds up to the greatest number defines cumulative material lead time. Syn: aggregate lead time, stacked lead time, composite lead time, critical path lead time.

CUMULATIVE MANUFACTURING LEAD TIME—The composite lead time when all purchased items are assumed to be in stock.

CUMULATIVE SUM—The accumulated total of all forecast errors, both positive and negative. This sum will approach zero if the forecast is unbiased. (cf. tracking signal). Syn: sum of deviations.

CURRENT PRICE—The price currently being paid versus standard cost.

CURVE FITTING—An approach to forecasting based upon a straight line, polynomial or other curve which describes some historical time series data.

CUSTOMER ORDER—An order for a particular product or a number of products from a customer. Often referred to as an "actual demand" to distinguish it from a forecasted demand.

CUSTOMER ORDER PROMISING—See order promising.

CUSTOMER SERVICE—Delivery of product to the customer at the time which the customer or corporate policy specifies. (cf. percent of fill).

CUSTOMER SERVICE RATIO—A measure of delivery performance

usually in the form of a percentage. In a make-to-stock company this percentage usually represents the number of items or dollars on the customer's order for a specific time period. In a make-to-order company it is usually some comparison of the number of jobs shipped in a given time period like a week compared with the number of jobs that were supposed to be shipped in that time period. (cf. percent of fill, stockout percentage).

CYBERNETICS—The study of control processes in mechanical, biological, electrical, and information systems.

CYCLE—A) The interval of time during which a system or process, such as seasonal demand or a manufacturing operation, periodically returns to similar initial conditions. In inventory control, a cycle is often taken to be the length of time between two replenishment shipments. B) The interval of time during which an event or set of events is completed. In production control, a cycle is often taken to be the length of time between the release of a manufacturing order and shipment to the customer or inventory. Syn: manufacturing cycle, manufacturing lead time.

CYCLE COUNTING—A physical inventory-taking technique where inventory is counted on a periodic schedule rather than once a year. For example, a cycle inventory count may be taken when an item reaches its reorder point, when new stock is received, or on a regular basis usually more frequently for high-value fast-moving items and less frequently for low-value or slow-moving items. Most effective cycle counting systems require the counting of a certain number of items every work day. (cf. ABC classification).

CYCLE REDUCTION STOCKS—Stock held to reduce delivery time.

CYCLE STOCK—One of the two main components of any item inventory, the cycle stock is the most active part; i.e., that which depletes gradually and is replenished cyclically when orders are received. Another part of the item inventory is the safety stock which is a cushion of protection against uncertainty in the demand or in the replenishment lead time. (cf. lot size, safety stock).

D

DAMPENERS—User input parameters to suppress the reporting of insignificant or unimportant action messages created during the computer processing of MRP.

DATA—Any representation such as numeric characters to which meaning can be assigned. (cf. information).

DATA BASE—A data file philosophy designed to establish the independence of computer programs from data files. Redundancy is minimized and data elements can be added to, or deleted from, the file designs without necessitating changes to existing computer programs.

DATA BASE MANAGEMENT—A set of rules about file organization and processing, generally contained in complex software, which controls the definition and access of complex, inter-related files which are shared by numerous application systems.

DATA COLLECTION—The method of recording a transaction at its source and transmitting it to a central storage device or computer. On-line systems incorporate the ultimate data collection techniques.

DATA FILE—A collection of related data records organized in a specific manner (one record for each inventory item showing product code, unit of measure, production costs, transactions, selling price, production lead time, etc.).

DATA PHONE—Any of a family of devices used to permit the transmission of data over telephone channels.

DEBIT MEMO—Document used to authorize the shipment of rejected material back to the supplier and create a debit entry in accounts payable.

DEBUG—To detect, locate and remove mistakes from a computer program, or manufacturing control system. Syn: diagnostic routine.

DECENTRALIZED DISPATCHING—The organization of the dispatching function into individual departmental dispatchers. (cf. centralized dispatching).

DECISION THEORY—Analysis of alternative actions where the consequences of the actions depend upon uncertain states of the world. Frequently the decision maker can obtain additional information about the state of the world through experimentation or sampling.

DECISION TREE—A method of analysis which evaluates alternative decisions in a tree like structure to estimate values and probabilities of outcomes. The expected probability of each outcome is the sum of all similar outcomes and their probability of occurring.

DEFAULT—Alternative action which will be taken by a computer program when the user fails to specify a variable parameter.

DEGREES OF FREEDOM—A statistical term indicating the number of variables or data points used for testing. The greater the degrees of freedom, the greater the confidence that can be placed on the statistical significance of the results.

DELAY REPORT—See: anticipated delay report.

DELINQUENT—See: past due.

DELINQUENT ORDER—A line item on the customer open order which has an original schedule ship date prior to the current date. Syn: late order, past due order.

DELIVERY CYCLE—The actual time from the receipt of the customer order to time of the shipment of the product.

DELIVERY POLICY—The company's goal for the time to ship product after receipt of a customer's order. The policy is sometimes stated as "our quoted delivery time".

DELIVERY SCHEDULE—The required or agreed time or rate of delivery of goods or services purchased for a future period.

DELPHI METHOD—A forecasting approach where the opinions of experts are combined in a series of questionnaires. The results of each questionnaire are used to design the next questionnaire, so that convergence of the expert opinion is obtained.

DEMAND—A need for a particular product or component. The demand could come from any number of sources, i.e. customer order, forecast, interplant, branch warehouse, service part, or to manufacturing the next higher level. At the finished goods level, "demand data" is usually different from "sales data" because demand does not necessarily result in sales, i.e. if there is no stock there will be no sale. (cf. dependent demand, independent demand).

DEMAND FILTER—A standard which is set to monitor individual sales data in forecasting models. Usually set to be tripped when the demand for a period differs from the forecast by more than some number of MAD's. (cf. mean absolute deviation).

DEMAND MANAGEMENT—The function of recognizing and managing all of the demands for products to insure that the master scheduler is aware of them. It encompasses the activities of forecasting, order entry, order promising, branch warehouse requirements, inter-plant orders, and service parts requirements. (cf. manufacturing production schedule).

DEPARTMENT OVERHEAD RATE—The overhead rate applied to jobs passing through a department. (cf. overhead).

DEPARTMENTAL STOCKS—An informal system of holding some stock in a production department. This action is taken as a protection from stock out in the stock room or for convenience; however, it results in increased inventory investment and possible degradation of the accuracy of the inventory records. (cf. floor stocks).

DEPENDENT DEMAND—Demand is considered dependent when it is directly related to or derived from the demand for other items or end products. Such demands are therefore calculated, and need not and should not be forecast. A given inventory item may have both dependent and independent demand at any given time. (cf. independent demand).

DEPRECIATION—An allocation of the original value of an asset against current income to represent the declining value of the asset as a cost of that time period. Depreciation does not involve a cash payment. It acts as a tax shield and thereby reduces the tax payment. (cf. fixed cost).

DETAIL FILE—A temporary reference file, usually containing current

data to be processed against a master file at a later date. (cf. master-file).

DETAILED SCHEDULING—The actual assignment of target starting and/or completion dates to operations or groups of operations to show when these must be done if the manufacturing order is to be completed on time. These dates are used in the dispatching operation. Syn: operations scheduling. (cf. dispatching).

DETERIORATION—Product spoilage, damage to the package, etc. One of the considerations in inventory carrying cost. (cf. obsolescence).

DETERMINISTIC MODELS—Models where no uncertainty is included. Examples include inventory models without safety stock considerations. (cf. stochastic models).

DEVIATION—The difference, usually the absolute difference, between a number and the mean of a set of numbers, or between a forecast value and the actual datum.

DIAGNOSTIC ROUTINE—See debug.

DIGIT—A character used to designate a quantity. The decimal system uses the digits 0–9; binary system: 0–1; hexadecimal system: 0–F.

DIGITAL COMPUTER—A computer that solves problems by operating on discrete data representing variables by performing arithmetic and logical processes on this data. (cf. analog computer).

DIRECT ACCESS—See random access.

DIRECT COSTING—See: variable costing.

DIRECT COSTS—Variable costs which can be directly attributed to a particular job or operation. (cf. variable costs).

DIRECT-DEDUCT INVENTORY TRANSACTION PROCESSING—A method of doing bookkeeping which decreases the book (computer) inventory of an item as material is issued from stock, and increases the book inventory as material is received into stock. The key concept here is that the book record is updated coincident with the movement of material out of or into stock. As a result, the book record is a representation of what is physically in stock. (cf. pre-deduct inventory transaction processing, post-deduct inventory transaction processing).

DIRECT DELIVERY—The consignment of goods directly from the vendor to the buyer. Frequently used where a third party acts as intermediary agent between vendor and buyer.

DIRECT LABOR—Labor which is specifically applied to the product being manufactured, or utilized in the performance of the service. (cf. direct costing).

DIRECT MATERIAL—Materials which become a part of the final product in measurable quantities (cf. indirect materials).

DISBURSEMENT—The issuance of raw material or components from a stores room.

DISBURSEMENT LIST—A printed list containing the identity and quantity of parts and assemblies to be withdrawn from stock and dispatched to the starting point of manufacture or assembly on a specific day. Syn: picking list.

DISC PACK—See: disk pack.

DISCOUNT—An allowance or deduction granted by the seller to the buyer, usually when certain stipulated conditions are met by the buyer, which reduces the cost of the goods purchased. A quantity discount is an allowance determined by the quantity or value of purchase. A cash discount is an allowance extended to encourage payment of invoice on or before a stated date which is earlier than the net date. A trade discount is a deduction from an established price for items or services, often varying in percentage with volume of transactions, made by the seller to those engaged in certain businesses and allowed irrespective of the time when payment is made.

DISCOUNTED CASH FLOW—A method of investment analysis in which future cash flows are converted, or discounted, to their value at present time. The rate of return for an investment is that rate at which the present value of all related cash flow equals zero. (cf. present value).

DISCRETE ORDER QUANTITY—See Lot-For-Lot.

DISCRETE WORD RECOGNIZER—Computer control device, commanded by human voice, for entry of data into a computerized

system containing discrete word structure and formatted data fields: nonintelligent word recognizers are typically limited by small, fixed vocabulary.

DISK PACK—A computer data storage device. It rotates at high speed and can contain large (300 million characters) quantities of data stored magnetically on circular tracks.

DISPATCHER—A production control person whose primary function is dispatching.

DISPATCHING—The selecting and sequencing of available jobs to be run at individual work stations and the assignment of these jobs to workers. (cf. centralized dispatching, decentralized dispatching, detailed scheduling, expediting, shop planning, closed loop MRP).

DISPATCH(ING) BOARD—See: control board.

DISPATCHING RULE—The logic used to assign priorities to jobs at a work center. (cf. critical ratio, due date rule, slack time rule).

DISPLAY—The representation of data in visible form, i.e., cathode ray tube, lights or indicators on the console of a computer, or a printed report.

DISTRIBUTED PROCESSING—A data processing organizational concept under which computer resources of a company are installed at more than one location with appropriate communication links. Processing is performed at the user's location generally on a mini-computer, and under the user's control and scheduling, as opposed to processing for all users being done on a large, centralized computer system.

DISTRIBUTED SYSTEMS—Refers to computer systems in multiple locations throughout an organization, working in a co-operative fashion, with the system at each location primarily serving the needs of that location but also able to receive and supply information from other systems within the network.

DISTRIBUTION—See: physical distribution.

DISTRIBUTION COST—This represents those items of cost for which the Marketing or Distribution Organization is responsible.

DISTRIBUTION OF FORECAST ERRORS—Tabulation of the forecast errors according to the frequency of occurrence of each error value. The errors in forecasting are, in many cases, normally distributed even when the observed data do not come from a normal distribution. (cf. normal distribution).

DISTRIBUTION REQUIREMENTS PLANNING (DRP)—The function of determining the needs to replenish inventory at branch warehouses. Frequently a time-phased order point approach is used where the planned orders at the branch warehouse level are "exploded" via MRP logic to become gross requirements on the supplying source. In the case of multi-level distribution networks, this explosion process can continue down through the various levels of master warehouse, factory warehouse, etc., and become input to the master production schedule. Demand on the supplying source(s) is recognized as dependent, and standard MRP logic applies. (cf. time-phased order point, physical distribution, push distribution system).

DISTRIBUTION RESOURCE PLANNING—The extension of Distribution Requirements Planning into the planning of the key resources contained in a distribution system: warehouse space, manpower, money, trucks and freight cars etc. (cf. distribution requirements planning).

DISTRIBUTION BY VALUE—A method of analyzing a line of products, usually in the form of a plot of the cumulative frequency distribution of the annual dollar sales of each item in the product line. This distribution is useful in the estimation of required cycle stocks and safety stocks in an inventory. Syn: ABC classification.

DISTRIBUTOR—A business that does not manufacture its own products but purchases and resells these products usually maintaining a finished goods inventory.

DOCK RECEIPTS—A receipt given for a shipment received or delivered at a pier or dock.

DOCUMENT—A medium for presenting interpreted information such as a sheet of paper or a punch card.

DOCUMENTATION—The process of collecting and organizing documents or the information recorded in documents. Usually refers to

the development of material specifying inputs, operations, and outputs of a computer system.

DOUBLE SMOOTHING—See: second order smoothing.

DOWNTIME—Time when the machines in the plant are not producing because they are down for repairs or other reasons. (cf. idle time).

DRAWBACK—A refund of customs duties paid on material imported and later exported.

DROP SHIPMENT—A distribution arrangement in which the seller serves as a selling agent by collecting orders but does not maintain inventory. The orders are sent to the manufacturer which ships directly to the customer.

DRP—Abbreviation for Distribution Requirements Planning.

DUE DATE—The date at which purchased material or production on order is due to be available for use. (cf. scheduled receipt date).

DUE DATE RULE—A dispatching rule which directs the sequencing of jobs by the earliest due date.

DUMB TERMINAL—Inexpensive means of interactive computer control; good for on-line fixed-program applications; all software is in host computer mainframe, no user programming or memory for data manipulation.

DUMP—To transfer all of the information contained in a record into another storage medium. For example, a disc record could be dumped onto tape.

DUTY—A tax levied by a government on the importation, exportation, or use and consumption of goods.

DYNAMIC LOT SIZING—See: least total cost, least unit cost, part period balancing, period order quantity. (cf. fixed order quantity).

DYNAMIC PROGRAMING—A method of sequential decision making in which the result of the decision in each stage affords the best possible to exploit the expected range of likely (yet unpredictable) outcomes in the following decision-making stages. (cf. linear programming).

E

EARMARKED MATERIAL—Reserved material on hand which is physically or on-line identified, rather than merely reserved in a balance-of-stores record. (cf. reserved material).

ECONOMETRIC MODELS—A system of simultaneous equations for forecasting, based on mutual dependence among the variables used.

ECONOMIC LOT SIZE—See: economic order quantity.

ECONOMIC ORDER QUANTITY (EOQ)—A type of fixed order quantity which determines the amount of product to be purchased or manufactured at one time in order to minimize the total cost involved, including the ordering costs (set-up of machines, writing orders, checking receipts, etc.) and carrying costs (cost of capital invested, insurance, taxes, space, obsolescence and spoilage). The economic order quantity may be calculated from the equation:

$$Q = \frac{2AS}{rv}$$

where Q is the quantity to be ordered, S is the annual sales, A is the ordering cost, r is the carrying cost, and v is the unit cost. (cf. LIMIT, carrying cost, ordering cost).

EDIT RUN—A computer run to validate that the data is within possible parameters and/or to format the data for subsequent uses.

EFFECTIVE DATE—The date on which a component or an operation is introduced or severed from a bill of material or an assembly process as the case may be. The effectivity dates are used in the explosion process to create demands for the correct material or assembly labor. Normally, bill of material systems provide for an effectivity "Start Date" and "Stop Date," signifying the start or stop of a particular relationship. Effectivity control may also be by serial number rather than date.

EFFECTIVITY—See: effective date.

EFFICIENCY—The relationship between the planned resource requirements, such as labor or machine time, for a task(s) and the actual resource time charged to the task(s). (cf. capacity).

ELEMENTAL PARTS—Those parts which consist of one piece; no assembly is involved. (cf. component).

EMPIRICAL—Pertaining to a statement or formula based upon experience or observation rather than on deduction or theory.

END ITEM—A product sold as a completed item or repair part; any item subject to a customer order or sales forecast. Syn: finished product.

ENDOGENEOUS VARIABLE—A variable whose value is determined by relationships included within the model (cf. exogenous variable).

END PRODUCT—See: end item.

ENGINEERING CHANGE—A revision to a parts list, bill of materials or drawings, authorized by the engineering department. Changes are usually identified by a control number and are made for "Safety", "Cost Reduction", or "Functionality" reasons. In order to effectively implement engineering changes all affected functions such as Materials, Quality Assurance, Assembly Engineering etc. should review and agree to the changes.

ENGINEERING DRAWINGS—A blue print or white print that visually presents the dimensional characteristics of a part or assembly at some stage of manufacture.

EOQ—Abbreviation for economic order quantity.

EOQ TABLES—Tables listing several ranges of monthly usages in dollars and the appropriate order size in dollars or months usage for each usage range.

EQUIVALENT DAYS—The standard hour requirements to a job converted to calendar days for scheduling purposes.

EQUIVALENT UNIT COST—The equivalent unit cost method uses the total cost incurred for all like units for a period of time divided by the "equivalent" units completed during the same time period. An equivalent unit can be the sum of several partially completed units. Two units 50% completed are equivalent to one unit 100% completed.

ERECTION DEPARTMENT—The final assembly department (usually used in a heavy industry like machine tool manufacture).

ESCALATION—An amount or percent by which a contract price may be adjusted if specified contingencies occur, such as changes in the vendor's raw material or labor costs.

EXCEPTION MESSAGE—See action message.

EXCEPTION REPORTS—Reports which list or flag only those items which deviate from plan.

EXECUTE—To perform; in the case of a computer program, to carry out the computer processing for which it was designed.

EXECUTIVE SYSTEM—A high-level program which controls the execution of other programs within the computer; synonymous with operating system.

EXOGENEOUS VARIABLE—A variable whose values are determined by considerations outside the model in question. (cf. endogenous variable).

EXPECTED COMPLETION QUANTITY—The planned quantity of a manufacturing order after expected scrap (cf. scrap factor).

EXPECTED DEMAND—The quantity expected to be withdrawn from stock during the lead time when usage is at the forecasted rate. Consequently it is identified with the forecast of demand during a lead time.

EXPECTED RECEIPT DATE—See: due date.

EXPECTED VALUE—The average value which would be observed in taking an action an infinite number of times. The expected value of an action is calculated by multiplying the outcome of the action by the probability of achieving that outcome. (cf. decision theory).

EXPEDITING—The "rushing" or "chasing" of production or purchase orders which are needed in less than the normal lead time. (cf. dispatching).

EXPEDITOR—A production control person whose primary duties are expediting.

EXPERIMENTAL ORDER—Usually an order generated by the labora-

tory or research and development group which must be run through regular production facilities. Syn.: laboratory order, engineering order, R and D order, pilot order.

EXPLOSION—An extension of a bill of material into the total of each of the components required to manufacture a given quantity of upper-level assembly or sub-assembly.

EXPLOSION LEVEL—See: low level code.

EXPONENTIAL DISTRIBUTION—A continuous probability distribution where the probability of occurrence either steadily increases or decreases. The steady increase case (positive exponential distribution) is used to model phenomena such as customer service level versus cost. The steady decrease case (negative exponential distribution) is used to model things such as the weight given to any one time period of demand in exponential smoothing.

EXPONENTIAL SMOOTHING—A type of weighted moving average forecasting technique in which past observations are geometrically discounted according to their age. The heaviest weight is assigned to the most recent datum. The smoothing is termed "exponential" because data points are weighted in accordance with an exponential function of their age. The technique makes use of a smoothing constant to apply to the difference between the most recent forecast and the critical sales datum, which avoids the necessity of carrying historical sales data. The approach can be used for data which exhibit no trend or seasonal patterns or for data with either (or both) trend and seasonality. (cf. first order smoothing, second order smoothing).

EXPOSURES—In an order point/order quantity system, this is the number of times that the system risks a stockout. This number of exposures is arrived at by dividing the lot size into the annual usage.

EXPRESS WARRANTY—When a seller makes some positive representation concerning the nature, character, use, and purpose of goods, which induces the buyer to buy, and the seller intends the buyer to rely thereon, the seller has made an express warranty.

EXTRAPOLATION—Estimating the future value of some data series based on past observations. Statistical forecasting represents a common example.

INTRINSIC FORECAST—A forecast based on a correlated leading indicator such as estimating furniture sales based on housing starts. Extrinsic forecasts tend to be more useful for large aggregations such as total company sales, than for individual product sales. (cf. intrinsic forecasts).

F

FABRICATION—A term used to distinguish manufacturing operations for components as opposed to assembly operations.

FABRICATION LEVEL—The lowest production level. The only components found are parts (as opposed to assemblies or subassemblies). These parts are either procured from outside sources or fabricated within the manufacturing organization. (cf. final assembly).

FABRICATION ORDER—A manufacturing order to a component making department authorizing it to produce component parts. (cf. assembly order). Syn: batch card, run order.

FABRICATOR—Using the product of the converter, the fabricator transforms it into a larger variety of products. Steel rods become nuts, bolts, and twist drills. Paper is made into bags or boxes. (cf. converter).

FAMILIES—Convenient groupings of related orders or similar parts.

FAMILY CONTRACTS—Grouping families of similar parts together on one purchase order to obtain pricing advantages and a continuous supply of material.

F.A.S.—1. Abbreviation for Final Assembly Schedule 2. Abbreviation for Free Alongside Ship.

FEASIBILITY STUDY—An analysis designed to establish the practicality of a given project and, if it appears to be advisable to do so, to determine the direction of subsequent project efforts.

FEATURE—See accessory, attachment, option.

FEEDBACK—The flow of information back into the control system so that actual performance can be compared with planned performance. (cf. servo system).

FEED STOCK—The primary raw material in a chemical or refining process normally received by pipeline or large-scale bulk shipments. Feed-stock availability is frequently the controlling factor in setting production schedule and rate for a process.

FIELD—A specified area of a record used for a particular category of data, e.g. a group of card columns in which "quantity-issued" will always be punched.

FIELD WAREHOUSE—A facility, public or private, which is used as a temporary place of storage for finished goods for ultimate sale to customers. It is separate and distinct from plant locations.

FIFO—First in, first out method of inventory evaluation. The assumption is that oldest inventory (first in) is the first to be used (first out). (cf. LIFO).

FILE—An organized collection of records or the storage device on which these records are kept.

FINAL ASSEMBLY—The highest or "zero level" assembled product. Frequently used as a name for the manufacturing department where the product is assembled. Syn: erection department, blending department, pack out department.

FINAL ASSEMBLY SCHEDULE—(FAS) Also referred to as the "finishing schedule" as it may include other operations than simply the final operation. It is a schedule of end items either to replenish finish goods inventory or to finish the product for a make-to-order product. For make-to-order products, it is prepared after receipt of a customer order, is constrained by the availability of material and capacity, and it schedules the operations required to complete the product from the level where it is stocked (or master scheduled) to the end item level. Syn: blending schedule, pack-out schedule.

FINISH-TO-ORDER—See: assemble-to-order.

FINISHED GOODS—See: end item.

FINISHED PRODUCT—See: end item.

FINISHED PRODUCTS INVENTORIES—Are those on which all manufacturing operations, including final test, have been completed. These may be either finished parts, like renewal parts or finished products which have been authorized for transfer to the finished stock account. These products are now available for shipment to the customer either as end items or repair parts.

FINISHING LEAD TIME—The time that is necessary to finish manufacturing a product after receipt of a customer order. The time allowed for the FAS. The finishing lead time should be equal to or less than the company's goal for shipping its product after receipt of a customer order.

FINITE LOADING—Conceptually the term means putting no more work into a factory than the factory can be expected to execute. The specific term usually refers to a computer technique that involves automatic shop priority revision in order to level load operation by operation. (cf. infinite loading).

FIRM PLANNED ORDER—A planned order that can be frozen in quantity and time. The computer is not allowed to automatically change it; this is the responsibility of the planner in charge of the item that is being planned. This technique can aid planners working with MRP systems to respond to material and capacity problems by firming up selected planned orders. Additionally, firm planned orders are the normal method of stating the master production schedule.

FIRST-COME-FIRST-SERVED RULE—A dispatching rule under which the jobs are sequenced by their arrival times. (cf. dispatching rules).

FIRST ORDER SMOOTHING—This phrase refers to single exponential smoothing. First order smoothing is best applied to forecasting problems where the data do not exhibit significant trend or seasonal patterns. (syn. single smoothing).

FIXED BUDGET—A budget of expected costs based upon a specific level of production or other activity. (cf. flexible budget).

FIXED COST—An expenditure that does not vary with the production volume, for example: rent, property tax, salaries of certain personnel. (cf. variable cost).

FIXED INTERVAL REORDER SYSTEM—A periodic reordering system where the time interval between orders is fixed, such as weekly, monthly, or quarterly, but the size of the order is not fixed and orders vary according to usage since the last review. This type of inventory control system is employed where it is convenient to examine inventory stocks on a fixed time cycle, such as in warehouse control systems, in systems where orders are placed mechanically, or for handling inventories involving a very large variety of items under some form of clerical control. Also called fixed reorder cycle system. (cf. min-max system, fixed order system).

FIXED ORDER QUANTITY—A lot sizing technique in MRP that will always cause planned order to be generated for a predetermined fixed quantity (or multiples thereof if net requirements for the period exceed the fixed order quantity). (cf. economic order quantity, lot-for-lot, period order quantity).

FIXED ORDER SYSTEM—An inventory control where the size of the order is fixed, but the time interval between orders depends on actual demand. The practice of ordering a fixed quantity when needed assumes that individual inventories are under constant watch. This system consists of placing an order of a fixed quantity (the reorder quantity) whenever the amount on hand plus the amount on order falls to or below a specified level (the order point or reorder point). (cf. two bin system, fixed interval reorder system, base-stock system).

FIXED PERIOD ORDERING—See period order quantity.

FIXED-VARIABLE BUDGETS—The objective of the fixed and variable budget is to segregate those costs which are fixed from those that vary with production volume, and measure fixed costs against a fixed target, and variable costs against a target based on the actual production volume. These are normally two ways of classifying costs into fixed and variable categories. The first method is to analyze each account and classify it as either fixed or variable. The second method is to use a statistical technique. This method determines for each individual type of manufacturing overhead, a fixed portion and variable rate. (cf. step budgets).

FLEXIBLE BUDGETS—There are two kinds of flexible budgets. These are (1) fixed-variable budgets and (2) step budgets. (See: fixed-variable budgets, step budgets).

FLOAT—Refers to (a) work-in-process, (b) an extra quantity due to batch production, (c) is sometimes used to indicate "cycle stock," (d) in CPM, the extra time before an activity becomes critical. (cf. work-in-progress).

FLOATING ORDER POINT—An order point which is responsive to changes in demand and/or to changes in lead time. (cf. fixed order system).

FLOOR STOCKS—Stocks of inexpensive production parts held in the factory from which production workers can draw without requisitions (cf. departmental stocks).

FLOW CHART—A systems analysis tool to graphically present a procedure in which symbols are used to represent operations, data, flow, and equipment. Syn: block diagram.

FLOW CONTROL—A term used to describe a specific production control system that is based primarily on setting production rates and feeding work into production to meet these planned rates, then following it through production to make sure that it is moving. Flow Control has its most successful application in repetitive production. (cf. order control).

FLOW SHOP—A shop in which machines and operators handle a standard, usually uninterrupted material flow. The operators tend to perform the same operations for each production run. A Flow Shop is often referred to as a mass production shop, or is said to have a continuous manufacturing layout. The shop layout (arrangement of machines, benches, assembly lines, etc.) is designed

to facilitate a product "flow." The process industries (chemicals, oil, paint, etc.) are extreme examples of Flow Shops. Each product, though variable in material specifications, uses the same flow pattern through the shop. Production is set at a given rate, and the products are generally manufactured in bulk.

FLUCTUATION INVENTORY—Inventories that are carried as a cushion to protect against forecast error. (cf. safety stock, buffer stock).

F.O.B. (FREE ON BOARD)—The term means the seller is required to place the goods aboard the equipment of the transporting carrier without cost to the buyer. The term "f.o.b." must be qualified by a name of location, such as shipping point, destination, name of a city, mill, warehouse, etc. The stated f.o.b. point is usually the location where title to the goods passes from the seller to the buyer. The seller is liable for transportation charges and the risks of loss or damage to the goods up to the point where title passes to the buyer. The buyer is liable for such charges and risks after passing of title.

FOLLOW-UP—Monitoring of job progress to see that operations are performed on schedule or that purchased material or products will be received on schedule. (cf. expediting).

FOOTING—Adding fields of information vertically.

FORECAST—A forecast is the extrapolation of the past into the future. It is an objective computation involving data as opposed to a prediction which is a subjective estimate incorporating management's anticipation of changes and new factors influencing demand. (cf. distribution of forecast errors). The implied objective is to minimize the forecast error.

FORECAST ERROR—The difference between actual demand and forecast demand, typically stated as an absolute value.

FORECAST HORIZON—The period of time into the future for which a forecast is prepared.

FORECAST INTERVAL—The length of time over which the forecast is computed.

FORECAST PERIOD—The time unit for which forecasts are prepared, such as monthly, weekly, or quarterly. (syn. forecast interval).

FORMAT—The predetermined arrangement of the characters of data for input into the computer or output from the computer.

FORMS CONTROL—An internal operating procedure under which a trained staff designs and standardizes imprinted forms.

FORMS EVALUATION—An investigative study of clerical forms and reports designed to increase their effectiveness and minimize (or eliminate where possible) their costs.

FORMULATION—A listing of all the components, including equipment and/or manpower resources that are used to produce a parent product. Also shown is the quantity of each component required to make one unit of the parent product (Syn: product structure, bill of material).

FORTRAN—A common computer language that can be used with a number of different computers. It is especially adapted to mathematical, scientific, and engineering problems. FORTRAN stands for *FOR*mula *TRAN*slation. (cf. COBOL, RPG).

FORWARD SCHEDULING—A scheduling technique where the scheduler proceeds from a known start date and computes the completion date for an order usually proceeding from the first operation to the last. (cf. backward scheduling).

FOURIER SERIES—A form of analysis useful for forecasting. The model is based upon fitting sine waves with increasing frequencies and phase angles to a time series.

FPO—Abbreviation for firm planned order.

FREE ALONGSIDE SHIP—The seller is liable for all changes and risks until the goods sold are delivered to the port on a dock which will be used by the vessel. Title passes to the buyer when the seller has secured a clean dock or ship's receipt of goods.

FREIGHT EQUALIZATION—When a purchase part is sold F.O.B. shipping point and several vendors are producing the part, the vendor who is the closest distance to the purchaser has an advantage because the freight charges from that vendor would be the lowest. To eliminate this disadvantage, the vendors further away charge the same freight rate as the closest vendor, or equalize the rate, and absorb the additional freight costs.

FREQUENCY DISTRIBUTION—A table that indicates the frequency with which data fall into each of any number of sub-divisions of the variable. The subdivisions are usually called classes. (cf. histogram).

FROZEN MASTER SCHEDULE—See: time fences.

FUNCTION—In business, a job, task, or possibly a process. In mathematics, an algebraic expression describing the relation between two or more variables, the function taking on a definite value, or values, when special values are assigned to the argument(s), or independent variables(s), of the function.

FUNCTIONAL SYSTEMS DESIGN—The development and definition of the business functions to be accomplished by a computer system, i.e. the work of preparing a statement of the data input, data manipulation and information output of proposed computer system in common business terms which can be reviewed, understood, and approved by a user organization. This statement, after approval, provides the basis for the computer systems design.

FUTURES—Contracts for the sale and delivery of commodities at a future time, made with the intention that no commodity be delivered or received immediately.

G

GANTT CHART—The earliest and best known type of control chart especially designed to show graphically the relationship between planned performance and actual performance named after its originator, Henry L. Gantt. Used for machine loading, where one horizontal line is used to represent capacity and another to represent load against that capacity or for following job progress where one horizontal line represents the production schedule and another parallel line represents the actual progress of the job against the schedule in time. Syn: job progress chart.

GAPPED SCHEDULE—The finishing of every piece in a lot at one work center before any piece in the lot can be processed at the succeeding work center, the movement of material in complete lots causing time gaps between the end of one operation and the beginning the next. Syn: gap phasing, straight-line schedule. (cf. overlapped schedule).

GAP PHASING—See: gapped schedule.

GENERAL PURPOSE—Refers to computer hardware or software which may be used for a wide variety of applications, as opposed to being designed for a particular function only.

GENERAL STORES—See: supplies.

GROSS REQUIREMENTS—The total of independent and dependent demand for a part or an assembly prior to the netting of on hand inventory and scheduled receipts.

GROUP CLASSIFICATION CODE—A part of material classification technique which provides for designation of characteristics by successively lower order groups of code. Classification may denote, for example, function, type of material, size, shape, etc. (cf. group technology).

GROUP TECHNOLOGY—An engineering and manufacturing philosophy which identifies the "sameness" of parts, equipment or processes. It provides for rapid retrieval of existing designs and anticipates a cellular type production equipment layout.

H

HANDLING COST—The cost involved in handling inventory. In some cases, the handling cost incurred may depend on the size of the inventory. For example, inventories over a fixed maximum level may have to be stored in a nearby warehouse at substantial cost per case of handling and trucking material stored outside, or production in excess of immediate needs of a given product may be specially packed and stored at a substantial extra-handling cost.

HARD COPY—A printed computer report, message, or special listing such as transaction lists, memory dumps, etc.

HARDWARE—The actual computer system machine units. (cf. software).

HARMONIC SMOOTHING—An approach to forecasting based upon fitting some set of sine and cosine functions to the historical pattern of a time series.

HASH TOTAL—An arithmetic total of data which would not normally be added together, such as part or job numbers, for checking to see that all transactions have been processed. (cf. cross foot).

HEADER RECORD—A record containing common, constant, or identifying information for a group of records which follow.

HEDGE—1. In Master Production Scheduling, a quantity of stock used to protect against uncertainty in demand. The hedge is similar to safety stock, except that a hedge has the dimension of timing as well as amount. A typical example of a "product mix" hedge might be for a company that makes a box with either gold or silver handles (all else same). If 40% of the boxes usually took gold handles and 60% silver, a master production schedule for 200 would explode into 200 common boxes, 80 gold handles, and 120 silver handles. The mix hedge might be to carry 50 extra gold and 50 extra silver handles. If at some point in time 180 of the 200 boxes are sold, uncertainty only exists as to the remaining 20; any silver or gold handles above 20 can be rescheduled until the next uncertainty occurs. Another hedge is called the "volume" hedge, which would be for the common boxes in this example. This hedge is typically carried by the master production scheduler just beyond some time fence in the future such that rolling the hedge over the time fence will result in planned orders for major expense items to now be in the action time bucket. 2. In Purchasing, any purchase or sale transaction having as its purpose the elimination of the negative aspects of price fluctuations.

HEURISTIC—A form of problem solving where the results or rules have been determined by rule of thumb or intuition instead of by optimization.

HEXADECIMAL—A number system using the equivalent of the decimal number sixteen as base. (cf. binary number system).

HIPO—A computer system design and documentation tool which consists of three types of diagrams:

- A single visual table of contents.

- One or more overview diagrams of functions at a general level.

- A number of detailed diagrams that break down the functions into the smallest diagram necessary to make them understandable.

The abbreviation of this top down approach stands for *Hierarchy plus Input, Processing, Output*.

HISTOGRAM—A graph of contiguous vertical bars representing a frequency distribution in which the groups or classes of items are marked on the x axis, and the number of items in each class is indicated by a horizontal line segment drawn above the x axis at a height equal to the number of items in the class.

HOLD ORDER—A written order directing that certain operations or work be interrupted or terminated, pending a change in design or other disposition of the material. Syn: stop work order. (cf. change order).

HOLD POINTS—Stock points for semi-finished inventory.

HORIZONTAL DISPLAY—A method of displaying output from an MRP system where requirements, scheduled receipts, projected balance, etc. are displayed horizontally, i.e. across the page. Horizontal displays are difficult to use in conjunction with bucketless systems. (cf. vertical display, bucketless system).

HYPOTHESIS TESTING—Statistical models used to form conclusions about a population or universe based upon sample information.

I

IDLE TIME—Time when operators or machines are not producing

product because of setup, maintenance, lack of material, tooling. (cf. machine utilization). Syn: down time.

IMPACT PRINTING—Printing which is produced by the impact of a key on an inked ribbon, transferring the impression of a character onto the paper located behind the ribbon.

IMPLEMENTATION—The act of installing a system into operation. It concludes the system project with the exception of appropriate follow up or post installation review. (cf. project model).

IMPLODE—Compression of detailed data into a summary-level record or report.

IMPUTED COST—Cost which is indirectly estimated and which is attributed rather than directly measured. (cf. absorption costing).

INACTIVE INVENTORY—Designates the stocks that are in excess of contemplated consumption within the planning period.

INCOMING BUSINESS—The number of orders or dollars worth of orders or units that have been received on orders from customers, particularly important to the forecaster who must compare incoming business against the forecast rather than actual shipments since these shipments do not reflect true customer demand because of backordered items, bottlenecks in the shipping room, etc. (cf. demand).

INCREMENTAL ANALYSIS—A method of economic analysis in which the cost of a single, additional unit is compared to its revenue. When the net contribution of an additional unit is zero, total contribution is maximized. (cf. total value analysis).

INCREMENTAL COST—1. Cost added in the process of finishing a part or assembly, assembling a group of parts or adding part(s) or assembly(s) to a higher level assembly. If the cost of the components of a given assembly equals \$5 and the additional cost of assembling the components is \$1, then the incremental assembly cost is \$1, while the total cost of the finished assembly is six dollars. 2. Additional cost incurred as a result of a decision selecting a different method of procuring a part, achieving a goal, fulfilling a requirement, etc.

INDENTED BILL OF MATERIAL—A form of multi-level bill of material. It exhibits the highest level sub-assemblies closest to the left side margin and all the components going into these sub-assemblies are shown indented to the right of the margin all subsequent levels of components are indented farther to the right. If a component is used in more than one sub-assembly within a given product structure, it will appear more than once, under every sub-assembly in which it is used.

INDEPENDENT DEMAND—Demand for an item is considered independent when such demand is unrelated to the demand for other items. Demand for finished goods, parts required for destructive testing and service parts requirements are some examples of independent demand. (cf. dependent demand).

INDICATOR—See: leading indicator.

INDIRECT COST—Cost which is not directly incurred by a particular job or operation. Certain utility costs, such as plant heating, are often indirect. An indirect cost can be either a fixed cost or a variable cost and is distributed to the product through the overhead rates (cf. direct cost).

INDIRECT LABOR—Work required to support production in general without being related to a specific product. For example, floor sweeping.

INDIRECT MATERIALS—Materials which become part of the final product but in such small quantities that their cost is not applied directly to the product. Instead their expense becomes a part of manufacturing supply or overhead costs.

INFINITE LOADING—Showing the work behind work centers in the time periods required regardless of the capacity available to perform this work. The term infinite loading is considered to be obsolete today, although the specific computer programs used to do infinite loading can now be used to perform the technique called capacity requirements planning. Infinite loading was a gross misnomer to start with, implying that a load could be put into a factory regardless of its availability to perform. The poor terminology obscured the fact that it is necessary to generate capacity requirements and compare these with available capacity before trying to

adjust requirements to capacity. (cf. capacity requirements planning, finite loading).

INFORMATION—The meaning derived from data which has been arranged and displayed in such a way that it can be related to that which is previously known. (cf. data).

INGREDIENT—See Component.

INITIALIZE—Setting all variable areas of a computer program or routine to their desired initial status, generally done the first time the code is executed during each run.

IN-PROCESS INVENTORY—See work-in-process.

INPUT—1. Work entering a production facility. 2. Data to be processed on a computer.

INPUT CONTROL—See input/output control.

INPUT DEVICE—A device such as a card reader or terminal keyboard which converts data from the form in which it has been received into electronic signals that can be interpreted by the computer. (cf. output device).

INPUT/OUTPUT CONTROL—A technique for capacity control where actual output from a work center is compared with the planned output developed by CRP. The input is also monitored to see if it corresponds with plans so that work centers will not be expected to generate output when jobs are not available to work on. (cf. capacity control, closed-loop MRP).

INQUIRY STATION—A terminal frequently with a typewriter keyboard where inquiries can be entered directly into the computer. The inquiry terminal can be geographically remote from the computer or at the computer console.

INSPECTION ORDER—An authorization to an inspection department or group to perform an inspection operation.

INSPECTION TICKET—Frequently used as a synonym for an inspection order—more properly a reporting of an inspection function performed.

INSTANTANEOUS RECEIPT—The receipt of an entire lot size quantity in a very short period of time (cf. non-instantaneous receipt).

INSTRUCTION—A statement to the computer in a series of characters that tells the computer what operation to perform. An instruction is usually made up of an operation code and one or more operands. (cf. processor program).

INSTRUCTION SHEET—See Operation Sheet.

INTELLIGENT TERMINAL—A programmable data device, usually remote from the main computer, which unburdens the host computer by performing preliminary data processing such as formatting, verification or validation.

INTELLIGENT VOICE TERMINAL—Intelligent terminal operated by human voice; software resident in terminal is user-programmable. Best for applications suiting an intelligent terminal but where hands-free data entry is cost advantageous.

INTERACTIVE—Refers to those applications where a user communicates with a computer program via a terminal, entering data and receiving responses from the computer.

INTERMEDIATE—See: component.

INTERMITTENT PRODUCTION—A production system in which the productive units are organized according to function. The jobs pass through the functional departments in lots and each lot may have a different routing. (cf. continuous production).

INTERPLANT DEMAND—Material to be shipped to another plant or division within the corporation. Although it is not a customer order, it is usually handled by the master production scheduling system in a similar manner. (cf. demand management).

INTERPOLATION—The process of finding a value of a function between two known values. Interpolation may be performed numerically or graphically.

INTERROGATE—Retrieve information from computer files by use of predefined inquiries or unstructured queries handled by a high-level retrieval language.

INTERRUPT—A break in the normal flow of a computer routine such that the flow can be resumed from that point at a later time. An interrupt is usually caused by a signal from an external source.

INTRANSIT LEADTIME—The time lag between the date of shipment

(at supplier shipping point) and the date of receipt (at the customer's dock). Normally customer's orders specify the date by which goods should be at his dock. Consequently this date should be offset by intransit leadtime for establishing a shipdate for the supplier.

INTRINSIC FORECAST—A forecast made based on past history, such as a forecast made from a moving average. (cf. extrapolation, extrinsic forecast).

INVENTORY—Items which are in a stock point or work-in-process and which serve to decouple successive operations in the process of manufacturing a product and distributing it to the consumer. Inventories may consist of finished goods ready for sale; they may be parts or intermediate items; they may be work-in-process; or they may be raw materials.

INVENTORY BUFFER—See: fluctuation inventory.

INVENTORY CONTROL—The activities and techniques of maintaining the stock of items at desired levels, whether they be raw materials, work-in-process, or finished products. (cf. inventory management).

INVENTORY CUSHION—See: fluctuation inventory.

INVENTORY FILE—A file containing the net quantity of all items normally maintained in inventory.

INVENTORY INVESTMENT—The number of dollars that are tied up in all levels of inventory.

INVENTORY MANAGEMENT—The branch of business management concerned with the planning and control of inventories. (cf. inventory control).

INVENTORY POLICY—A definite statement of the philosophy of management on inventories.

INVENTORY SHRINKAGE—Losses resulting from scrap, deterioration, pilferage, etc.

INVENTORY TAX—Taxes based upon the value of inventory on hand at a particular time.

INVENTORY TURNOVER—The number of times that an inventory "turns over," or cycles during the year. One way to compute inventory turnover is to divide the average inventory level into the annual cost of sales. For example, if average inventory were three million dollars and cost of sales were twenty-one million dollars, the inventory would be considered to "turn" seven times per year.

INVENTORY USAGE—The value or the number of units of an inventory item consumed over a period of time.

INVENTORY VALUATION—The value of the inventory at either its cost or its market value. Because inventory value can change with time, some recognition must be taken of the age distribution of inventory. Therefore, the cost value of inventory, under accounting practice, is usually computed on a first-in-first-out (FIFO), last-in-first-out (LIFO) basis, or a standard cost system to establish the cost of goods sold. (cf. absorption costing, variable costing, retail method).

INVENTORY WRITE-OFF—A deduction of inventory dollars from the financial statement because the inventory is no longer saleable or because of shrinkage, i.e. the value of the physical inventory is less than its book value.

I/O—1. Abbreviation for computer input/output. 2. Abbreviation for Input/Output Control.

ISSUE CYCLE—The time required to generate a requisition for material, pull the material from an inventory location and to move it to its destination.

ITEM—Any unique manufactured or purchased part or assembly, that is, end product, assembly, sub-assembly, component, or raw material.

ITEM MASTER FILE—Typically this computer file contains identifying and descriptive data, control values (dead times, lot sizes etc.) and may contain data on inventory status, requirements and planned orders. There is normally one record in this file for each stock keeping unit. Item master records are linked together by product structure records, thus defining the bill of material.

J

JCL—Job control language; statements which supply information to the operating system about a particular job—how much memory is required, run time, job priority, etc.

JOB LOT—A relatively small number of a specific part or product that is produced at one time.

JOB ORDER—See: manufacturing order.

JOB ORDER COSTING—A costing system in which costs are collected to specific jobs. This system can be used with either actual or standard costs in the manufacturing of distinguishable units or lots of products. (cf. process cost system, product costing).

JOB PROGRESS CHART—See: Gantt chart.

JOB SHOP—A functional organization whose departments or work centers are organized around particular types of equipment or operations, such as drilling, forging, spinning, or assembly. Products flow through departments in batches corresponding to individual orders, which may be either stock orders or individual customer orders. Syn: intermittent production.

JOB SHOP LAYOUT—The arrangement of equipment in functional areas.

JOB SHOP SIMULATION—Simulation of work flow through a manufacturing facility, usually using a computer program. (cf. simulation).

JOB STATUS—A periodic report showing the plan for completing a job (usually the requirements and completion date) and the progress of the job against that plan. (cf. stock status).

JOB TICKET—See: time ticket.

JOINT ORDER—An order on which several items are combined for the purpose of obtaining volume or transportation discounts.

JUDGMENT ITEMS—Those inventory items which cannot be effectively managed by mechanical means because of age (new or obsolete product) or management decision (promotional product). (cf. ABC classification).

JUSTIFICATION—The adjusting, or shifting of digits to the right or left, to fit a prescribed report format.

K

KIT—The components of an assembly which have been pulled from stock and readied for movement to the assembly area.

KITTING—The process of removing components of an assembly from the stock room and sending them to the assembly floor as a kit of parts. This action may take place automatically whenever a full set of parts is available and/or it may be done only upon authorization by a designated person. (cf. picking, staging).

KITTING AREA—See: accumulation bin.

L

LABOR CHIT—See: time ticket.

LABOR CLAIM—A factory worker's regular report telling the jobs he has worked on, the number of pieces, number of hours, etc. and often the amount of money to which he is entitled. A labor claim is usually made on a labor chit or time ticket. Syn.: labor voucher.

LABOR LOADING—The process of applying expected labor requirements against the capacity for that labor. (cf. finite loading, infinite loading, load leveling).

LABOR PRODUCTIVITY—The rate of output of a worker or group of workers, per unit of time, compared to an established standard or rate of output.

LABOR TICKET—A form used to record the application of labor to specific jobs or production operations.

LABOR VOUCHER—See: labor claim.

LAP PHASING—See: overlapped schedule.

LAYOUT—The kits of components ahead of the assembly department waiting to be put together. Syn: staged material.

LCL—Less than a carload lot shipment.

LEADING INDICATORS—Specific business activity indexes that are useful to the forecaster since any trends in these indicators will be reflected later on in his forecast. For example, housing starts is a leading indicator for the industry that supplies builder's hardware. (cf. extrinsic forecast).

LEADTIME—A span of time required to perform an activity. In a production and inventory control context, the activity in question is normally the procurement of materials and/or products either from an outside supplier or from one's own manufacturing facility. The individual components of any given leadtime can include some or all of the following: order preparation time, queue time, move or transportation time, receiving and inspection time. (cf. manufacturing lead time, purchasing lead time).

LEADTIME INVENTORY—This is inventory which is carried on hand during the leadtime period in simple inventory systems. The leadtime inventory will be equal to forecasted usage during the replenishment leadtime. Syn: active inventory.

LEADTIME OFFSET—A term used in MRP where a planned order receipt in a one time period will require the release of that order in some earlier time period based on the leadtime for the item. The difference between the due date and the release date is the leadtime offset.

LEARNING CURVE—A planning technique particularly useful in the project oriented industries where new products are phased in rather frequently. The basis for the learning curve calculation is the fact that workers will be able to produce the product more quickly after they get used to making it.

LEAST SQUARES METHOD—A method of curve fitting which selects a line of best fit through a plot of data so as to minimize the sum of squares of the deviations of the given points from the line. (cf. regression analysis).

LEAST TOTAL COST—A dynamic lot sizing technique that calculates the order quantity by comparing the carrying cost and the setup (or ordering) costs for various lot sizes and selects the lot where these are not nearly equal. (cf. part period balancing).

LEAST UNIT COST—A dynamic lot-sizing technique that adds ordering cost and inventory carrying cost for each trial lot size and divides by the number of units in the lot size, picking the lot size with the lowest unit cost.

LEVEL—Every part or assembly in a product structure is assigned a level code signifying the relative level in which that part or assembly is used within that product structure. Normally the end items are assigned level "0" and the components/sub assemblies going into it level "1" and so on. MRP explosion process starts from level "0" and proceeds downwards one level at a time.

LEVEL OF SERVICE—A measure of the demand that is routinely satisfied by inventory, e.g., the percentage of orders filled from stock; the percentage of dollar demand filled from stock. (cf. percent of fill, stock out percent, customer service ratio).

LIFO—Last in, first out method of inventory evaluation. The assumption is that the most recently received (last in) is the first to be used or sold (first out). (cf. FIFO).

LIMIT—Lot-Size Inventory Management Interpolation Technique. A technique for looking at the lot sizes for groups of products to determine what affect economic lot sizes will have on the total inventory and total set-up costs.

LIMITED CONTINUOUS WORD/SPEECH—Voice recognition capability for certain sets of words uttered without pause (typically digits such as part numbers or postal zip codes), that can be trained into user-programmable voice equipment designed with proper recognition processing algorithms.

LIMITING OPERATION—In a series of operations with no alternative

routings, the capacity of the total system can be no greater than the operation with the least capacity. As long as this limiting condition exists, the total system can be effectively scheduled by simply scheduling the limiting operation. Syn: bottleneck.

LINEAR DECISION RULES—A modeling approach for the establishment of aggregate work force levels, based upon minimizing the total cost of hiring, firing, holding inventory, backorders, payroll, overtime, and undertime.

LINEAR PROGRAMMING—Mathematical models for solving linear optimization problems through minimization (or maximization) of a linear function subject to linear constraints. For example, in blending gasoline and other petroleum products, many intermediate distillates may be available. Prices and octane ratings, as well as upper limits on capacities of input materials which can be used to produce various grades of fuel are given. The problem is to blend the various inputs in such a way that: (a) cost will be minimized (profit will be maximized), (b) specified optimum octane ratings will be met, and (c) the need for additional storage capacity will be avoided.

LINE BALANCING—An assembly line process can be divided into elemental tasks, each with a specified time requirement per unit of product and a sequence relationship with the other tasks. Line balancing is the assignment of these tasks to work stations so as to minimize the number of work stations and to minimize the total amount of unassigned time at all stations. Line balancing can also mean a technique for determining the product mix that can be run down an assembly line to provide a fairly consistent flow of work through that assembly line at the planned line rate. For example, if an automotive assembly line happened to be scheduled one day with nothing but convertibles, some workers would be standing idle while others would not be able to keep pace with the line.

LINE-BALANCING STOCK—See: decoupling inventory.

LINE OF BALANCE PLANNING—A project planning technique using a leadtime offset chart and a chart of required final assembly completions to graphically plot a third bar chart showing the number of each component that should be done to date. This bar chart forms a descending line and aggregate component completions are then plotted against this "line of balance." This is a crude form of material planning. (cf. Gantt chart).

LINE ITEM—One item on a customer order, regardless of quantity.

LIVE LOAD—See: available work.

LOAD—This is the amount of scheduled work ahead of a manufacturing facility, usually expressed in terms of hours of work or units of production.

LOAD CENTER—See: work center.

LOAD LEVELING—Spreading orders out in time or rescheduling operations so that the amount of work to be done in the time periods tends to be distributed evenly. (cf. finite loading).

LOAD PROFILE—A display of future capacity requirements based on planned and released orders over a given span of time. Syn: load projection.

LOAD PROJECTION—See: load profile.

LOCATOR FILE—A file used in the stockroom or stores room where each item does not have a specific location. The locator file records where the product has been selected to be stored.

LOGISTICS—In an industrial context, this term refers to the art and science of obtaining and distributing material and product. In a military sense (where it has greater usage), its meaning can also include the transportation of personnel.

LOG NORMAL DISTRIBUTION—A continuous probability distribution where the logarithms of the variable are normally distributed.

LONG-RANGE RESOURCE PLANNING—A planning activity for long term capacity decisions, based on the production plan and perhaps on even more gross data (e.g., sales per year) beyond the time horizon for the production plan. This activity is to plan long term capacity needs out to the time period necessary to acquire gross capacity additions such as a major factory expansion.

LOOP—A sequence of computer instructions that repeats itself until a

predetermined count or other test is satisfied, or until the process is interrupted by operator intervention.

LOT-FOR-LOT—A lot sizing technique in MRP which generates planned orders in quantities equal to the net requirements in each period. (Syn: discrete order quantity).

LOT NUMBER—A unique identification assigned to a homogeneous quantity of material. Syn: batch number, mix number.

LOT SIZE—The amount of a particular item that is ordered from the plant or a vendor. Syn: order quantity.

LOT SIZE CODE—A code which indicates the lot sizing technique selected for a given item. Syn: order policy code.

LOT SIZE INVENTORY—Inventories which are maintained whenever quantity price discounts, shipping costs, or set-up costs, etc. make it more economical to purchase or produce in larger lots than are needed for immediate purposes.

LOT SIZING—The process of, or techniques used in, determining lot size.

LOW LEVEL CODE—Identifies the lowest level in any bill of material at which a particular component may appear. Net requirements for a given component are not calculated until all the gross requirements have been calculated down to that level. Low level codes are normally calculated and maintained automatically by the computer software. (cf. level).

LSI—Large-scale integration; refers to the compression of a large number of computer circuits on a single chip.

M

M-Day Calendar—See: Manufacturing Calendar

MACHINE CENTER—See: work center.

MACHINE CODE—See: absolute language.

MACHINE HOUR—A method of allocating costs based upon the machine hours, rather than man hours, used in the manufacturing process.

MACHINE LANGUAGE—See: absolute language.

MACHINE LOADING—The accumulation by work station(s), machine, or machine group of the hours generated from the scheduling of operations for released orders by time period. Machine loading differs from capacity requirements planning in that it does not use the planned orders from MRP but operates solely from scheduled receipts. As such, it has very limited usefulness. (cf. capacity requirements planning).

MACHINE UTILIZATION—The percent of time that a machine is running production as opposed to idle time. (cf. idle time, running time).

MACRO—A term used for a computer symbolic language instruction which will generate more than one absolute language instruction (cf. processor program).

MAD—See: mean absolute deviation.

MAGNETIC DISC—A metal or plastic (floppy) disc looking something like a phonograph record whose surface can store data in the form of magnetized spots. (cf. disc pack).

MAGNETIC DRUM—A metal cylinder whose surface can have data recorded on it in the form of magnetized spots.

MAGNETIC TAPE—Plastic tape similar to that used in tape recorders on which data is stored in the form of magnetized spots.

MAIN STORAGE—See: primary storage.

MAKE-OR-BUY DECISION—The act of deciding whether to produce an item in-house or buy it from an outside vendor.

MAKE-TO-ORDER PRODUCT—The end item is finished after receipt of a customer order. Frequently long leadtime components are planned prior to the order arriving in order to reduce the delivery time to the customer. Where options or other subassemblies are stocked prior to customer orders arriving, the term "assemble-to-order" is frequently used.

MAKE-TO-STOCK PRODUCT—The end item is shipped from finished goods, "off the shelf" and therefore is finished prior to a customer order arriving.

MANAGEMENT INFORMATION SYSTEMS—A manual or computerized system which anticipates the wide use of data for management planning and control purposes. Accordingly, the data is organized in a data base and is readily available to a variety of management functions.

MANAGEMENT SCIENCE—See: operations research.

MANUAL RESCHEDULING—The most common method of rescheduling open orders (scheduled receipts). Under this method the MRP system provides information on the part numbers and order numbers that need to be rescheduled. Due dates and/or order quantities changes required are then analyzed and changed by material planners or other authorized persons. (cf. automatic rescheduling).

MANUFACTURING AUTHORIZATION—See: manufacturing order.

MANUFACTURING CALENDAR—A calendar, used in Inventory and Production Planning functions, which consequently numbers only the working days so that the component and work order scheduling may be done based on the actual number of work days available. (Syn: M-Day Calendar).

MANUFACTURING CYCLE—See: cycle.

MANUFACTURING DATA SHEET—See: route sheet.

MANUFACTURING LEADTIME—The total time required to manufacture an item. Included here are order preparation time, queue time, set-up time, run time, move time, inspection and put-away time.

MANUFACTURING ORDER—A document or group of documents conveying authority for the manufacture of specified parts or products in specified quantities. (cf. change order).

MANUFACTURING PROCESS—The series of activities performed upon material to convert it from the raw or semifinished state to a state of further completion and a greater value.

MANUFACTURING RELEASE—See: manufacturing order.

MANUFACTURING RESOURCE PLANNING—A method for the effective planning of all the resources of a manufacturing company. Ideally it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer "what if" questions. It is made up of a variety of functions, each linked together: Business Planning, Production Planning, Master Production Scheduling, Material Requirements Planning, Capacity Requirements Planning and the execution systems for capacity and priority. Outputs from these systems would be integrated with financial reports such as the business plan, purchase commitment report, shipping budget, inventory projections in dollars, etc. Manufacturing resource planning is a direct outgrowth and extension of MRP. Often referred to as MRP II. (cf. closed-loop MRP). For additional information, see Preface page iii: "MRP."

MARGINAL COST—The additional out of pocket costs incurred when the level of output of some operation is increased by one unit. (cf. incremental analysis, marginal revenue).

MARGINAL REVENUE—The additional income received when the level of output of some operation is increased by one unit. (cf. marginal cost).

MARKET DEMAND—The total need for a product or line of product.

MARKET DEMAND SHARE—The portion of total need a company expects to get.

MARKET HEDGE—See: hedge.

MARKET SHARE—The actual portion of demand that a company achieves.

MARK-SENSE—A mechanized technique of punching data into computer cards. A graphite line positioned on the card is read electronically and converted into holes by special equipment.

MASS PRODUCTION—High quantity production characterized by detailed planning of every operation and specialization of equipment and labor (Syn: continuous production).

MASS STORAGE—Refers to hardware devices providing massive amounts of on-line secondary storage, generally using strips of inexpensive, magnetic media which can be accessed randomly, but with slower access times than those of conventional tape or disk devices.

MASTER FILE—A main reference file of information such as bills of material or routing files. (cf. detail file).

MASTER PRODUCTION SCHEDULE (MPS)—For selected items, it is a statement of what the company expects to manufacture. It is the anticipated build schedule for those selected items assigned to the master scheduler. The master scheduler maintains this schedule and, in turn, it becomes a set of planning numbers which "drives" MRP. It represents what the company plans to produce expressed in specific configurations, quantities, and dates. The MPS should not be confused with a sales forecast which represents a statement of demand. The master production schedule must take forecast plus other important considerations (backlog, availability of material, availability of capacity, management policy and goals, etc.) into account prior to determining the best manufacturing strategy. (Syn: master schedule.). (cf. closed-loop MRP).

MASTER ROUTE SHEET—The authoritative route sheet from which all other format variations and copies are derived. (cf. route sheet).

MASTER SCHEDULE—See: master production schedule.

MASTER SCHEDULE ITEM—A part number selected to be planned by the master scheduler. The item would be deemed critical in terms of its impact on lower level components and/or resources such as skilled labor, key machines, dollars, etc. Therefore, the master scheduler, not the computer would maintain the plan for these items. A master schedule item may be an end item, a component, a pseudo number or a planning bill of material.

MASTER SCHEDULER—The job title of the person who manages the Master Production Schedule. This person should be the best scheduler available as the consequences of the planning done here has a great impact on material and capacity planning. Ideally, the person would have substantial product and shop knowledge.

MATERIAL—Any commodity used directly or indirectly in producing a product, viz., raw materials, component parts, sub-assemblies, and supplies. (cf. reserved material, earmarked material, available material).

MATERIAL ORDER—See: production materials requisition.

MATERIAL REQUIREMENTS PLANNING—See: MRP.

MATERIALS CONTROL—See inventory control.

MATERIALS MANAGEMENT—A term to describe the grouping of management functions related to the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control of work-in-process to the warehousing, shipping and distribution of the finished product. Differs from materials control in that the latter term, traditionally, is limited to the internal control of production materials.

MATERIALS REQUISITION—See: production materials requisition.

MATRIX—A mathematical array having height, width, and sometimes depth, into which collections of data may be stored and processed.

MATRIX BILL OF MATERIAL—A chart made up from the bills of material for a number of products in the same or similar families. It is arranged in a matrix with parts in columns and assemblies in rows (or vice versa) so that requirements for common components can be summarized conveniently.

MAXIMUM INVENTORY—The maximum allowable inventory for an independent demand item. Example would be the sum of the economic lot size plus two times the reserve stock. (cf. min-max system).

MAXIMUM ORDER QUANTITY—An order quantity modifier, applied after the lot size has been calculated, that limits the order quantity to a pre-established maximum.

MAXIMUM REASONABLE DEMAND—(During lead time) the sum of the expected demand and an allowance for protection against the uncertainty inherent in any forecast. The allowance for error is the product of the safety factor and the standard deviation of the errors in forecasting over a lead time. That is, Maximum Reasonable Demand = Expected Demand + (Safety Factor × Standard Deviation). (cf. safety stock).

MEAN—The arithmetic average of a group of values. (cf. median, mode).

MEAN ABSOLUTE DEVIATION (MAD)—The average of the absolute values of the deviations of some observed value from some expected value. MAD can be calculated based on observations and the arithmetic mean of those observations. An alternative is to

calculate absolute deviations of actual sales data minus forecast data. These data can be averaged in the usual arithmetic way or with exponential smoothing.

MEASURE OF SERVICE—See: level of service.

MEDIAN—The middle value in a set of measured values when the items are arranged in order of magnitude. If there is no middle value, the median is the average of the two middle values. (cf. mode, mean).

MEMORY—See: storage.

MERGE—To combine two or more files of data into one file in a predetermined sequence. (cf. collate).

METHODS-TIME MEASUREMENT—A system of predetermined motion-time standards, a procedure which analyzes any operation into certain human motions and assigns to each motion a predetermined time standard determined by the nature of the motion and the conditions under which it was made. Abbreviated as MTM.

MICR—Magnetic Ink Character Recognition. A mechanized method of data collection involving the electronic reading of data which has been printed in magnetic ink. Most checks have the bank transit number imprinted in magnetic ink at the lower left part of the check.

MICROCOMPUTER/PROCESSOR—A special purpose 'computer-on-a chip' designed to control or monitor a specific purpose. Common examples of this technology are electronic games, traffic signals and editing typewriters.

MICRO-SECOND—One-millionth of a second. (cf. nano-second).

MICROWAVE TRANSMISSION—A highly effective method of communication using high frequency radio waves and special equipment. Transmission rates of over 5,000 characters per second are attainable by this method in comparison to approximately 300 characters per second using voice grade channels.

MINI-COMPUTER—A small, programmable, general-purpose computer often used for dedicated application or for distributed processing.

MINIMUM COST ORDER QUANTITY—see: economic order quantity.

MINIMUM INVENTORY—The minimal allowable inventory for an independent demand item. See: safety stock.

MINIMUM ORDER QUANTITY—An order quantity modifier, applied after the lot size has been calculated, that increases the order quantity to a pre-established minimum.

MIN-MAX SYSTEM—Used in fixed interval, periodic, inventory management systems. It is equal to the sum of reserve stock, demand during lead time, and demand during replenishment. (cf. target inventory level).

M.I.S.—Abbreviation for Management Information Systems.

MIX CONTROL—The control of the individual products going through the plant. (cf. line balancing).

MIX TICKET—See: assembly parts list.

MNEMONIC—A technique used to assist human memory. A mnemonic represents and resembles the original word by using several letters of the original word in sequence. For example, mlpy for multiply. (cf. acronym).

MODE—The most common or frequent value in a group of values. (cf. mean, median).

MODEL—A representation of a process or system that attempts to relate the most important variables in the system in such a way that analysis of the model leads to insights into the system. Frequently the model is used to anticipate the result of some particular strategy in the real system. (cf. simulation).

MODEM—Device which changes data from digital computers into analog for transmission over communications lines; a modem at the receiving end converts the data back into digital format. Also known as a data set.

MODULAR BILL (OF MATERIAL)—A type of planning bill which is arranged in product modules or options. Often used in companies where the product has many optional features, e.g. automobiles. (cf. planning bill, common parts bill, super bill, option).

MODULAR SYSTEM—A system design methodology which recognizes that different levels of experience exist in organizations and thereby develops the system in such a way so as to provide for

segments or modules to be installed at a rate compatible with the users' ability to implement the system.

MODULE—A program unit that is discrete and identifiable with respect to design, compilation, and testing; eventually combined with other units to form a complete program.

MONTE CARLO SIMULATION—A subset of digital simulation models based on random or stochastic processes. (cf. simulation).

MORTGAGED MATERIAL—See: reserved material.

MOVEMENT INVENTORY—A type of in-process inventory which arises because of the time required to move goods from one place to another. (cf. transportation inventory).

MOVE ORDER—The authorization to move a particular item from one location to another.

MOVE TICKET—A document used in dispatching to authorize and/or record movement of a job from one work center to another. It may also be used to report other information such as the active quantity or the material storage location.

MOVE TIME—The actual time that a job spends in transit from one operation to another in the shop.

MOVING AVERAGE—An arithmetic average of the n most recent observations. As each new observation is added, the oldest one is dropped. The value of n , the number of periods to use for the average, reflects responsiveness versus stability in the same way that the choice of smoothing constant does in exponential smoothing. (cf. weighted average).

MPS—Abbreviation for master production schedule.

MRP—Material Requirements Planning. A system which uses bills of material, inventory and open order data, and master production schedule information to calculate requirements for materials. It makes recommendations to release replenishment orders for material. Further, since it is time-phased, it makes recommendations to reschedule open orders when due dates and need dates are not in phase. Originally seen as merely a better way to order inventory, today it is thought of primarily as a scheduling technique, i.e. a method for establishing and maintaining valid due dates on orders. (cf. closed-loop MRP, manufacturing resource planning). For additional information, see Preface page iii: "MRP."

MTM—Abbreviation for methods-time measurement.

MULTI-DROP—A communication system configuration using a single channel or line to serve multiple terminals, often at different geographical locations. Use of this type of line normally requires a polling mechanism and a unique address for each terminal. Also called a multipoint line.

MULTI-LEVEL BILL OF MATERIAL—A multi-level bill shows all the components that are directly or indirectly used in an assembly together with the quantity required of every component. If a component is a sub-assembly, all the components of the sub-assembly will also be exhibited in the Multi-Level bill.

MULTI-LEVEL WHERE USED—Multi-level where used for a component lists all the assemblies in which that component is directly used and the next higher level assemblies into which the parent assembly is used.

MULTI-PROCESSING—Using two interconnected computers simultaneously.

MULTI-PROGRAMMING—Executing more than one program simultaneously on one computer.

MULTIPLE REGRESSION MODELS—A form of regression analysis where the model involves more than one independent variable such as sales being forecasted based upon housing starts, GNP, and disposable income.

MURPHY'S LAW—A tongue-in-cheek observation which states "if anything can go wrong, it will."

N

NANO-SECOND—One-billionth of a second. (cf. pico-second).

NEGOTIATION—The process by which a buyer and a vendor agree upon the conditions surrounding the purchase of an item.

NET CHANGE MRP—An approach via which the material requirements plan is continually retained in the computer. Whenever there is a change in requirements, open order or inventory status, or engineering usage, a partial explosion is made only for those parts affected by the change. Net changes systems may be continuous and totally transaction oriented, or done in a periodic (often daily) batch. (cf. regeneration MRP, requirements alteration).

NET REQUIREMENTS—In MRP, the net requirements for a part or an assembly are derived as a result of netting gross requirements against inventory on hand and the scheduled receipts. Net requirements, lot sized and offset for lead time, become planned orders.

NETTING—The process of calculating net requirements.

NET WEIGHT—The weight of an article exclusive of the weights of all packing materials and containers.

NETWORK—Connection of geographically-separated computers and/or terminals over communication lines. Control of transmission is managed by a standard protocol conformed to by all users; in some cases a given computer is responsible for all traffic control.

NETWORK PLANNING—A generic term for techniques that are used to plan complex projects. Two of the best known network planning techniques are the critical path method and PERT.

NODE—Any point in a communications network which is individually addressable, be it a terminal, computer, or communications controller.

NOISE—The unpredictable or random difference between the observed data and the "true process."

NOMOGRAM—A computational aid consisting of two or more scales drawn and arranged so that the results of calculations may be found by the linear connection of points on them. Also called an "alignment chart." Often used for calculating economic lot sizes, or sample sizes for work measurement observations.

NON-IMPACT PRINTING—Printing processes in which characters are transferred to paper by means other than physically striking the paper with a key driven hammer; in non-impact printing, characters are created by ink jets, thermal devices, and lasers.

NON-INSTANTANEOUS RECEIPT—The receipt of a lot quantity over a period of time because of a relatively slow process. This requires a modification to the normal economic order quantity formula. (cf. instantaneous receipt).

NON-LINEAR PROGRAMMING—Similar to linear programming but incorporating a non-linear objective function and linear constraints or a linear objective function and non-linear constraints or both a non-linear objective function and non-linear constraints.

NON-SIGNIFICANT PART NUMBERS—Part numbers that are assigned to each part but do not convey any information about the part. They are identifiers, not descriptors. (cf. significant part numbers).

NORMAL DISTRIBUTION—A particular statistical distribution. For a distribution to be classified as a "normal" distribution, it must be unimodal—that is, most of the observations must fall fairly close to one mean—and symmetrical; that is to say, a deviation from the mean is as likely to be plus as it is likely to be minus. When graphed, the normal distribution takes the form of a bell-shaped curve. (cf. frequency distribution).

O

OBJECT PROGRAM—An absolute language program of instructions for the computer made from a source program written in symbolic language. The programmer writes the source program and a processor program translates it into an object program.

OBJECTIVE FUNCTION—The goal or function which is to be optimized in a model. Most often it is a cost function which we are attempting to minimize subject to some restrictions or a profit func-

tion which we are trying to maximize subject to some restriction. (cf. constraint).

OBLIGATED MATERIAL—See: reserved material.

OBSOLESCENCE—Loss of product value resulting from a model or style change or technological development. (cf. deterioration).

OFF-GRADE—Finished product which does not meet normal shipping specifications. Material may be sold as is for special uses or salvaged by blending or recycling. Normally maintained as a separate SKU and carried at less than full inventory value.

OFF-LINE OPERATIONS—Data processing operations that are handled outside of the regular computer program. For example, the computer might generate a magnetic tape which would then be used to generate a report off-line while the computer was doing another job.

OFFSETTING—See: lead time offset.

ON HAND—The balance shown in perpetual inventory records as being physically present at the stocking locations.

ON-LINE PROCESSING—A data processing approach where transactions are entered into the computer directly as they occur.

ON ORDER—The stock on order is the quantity represented by the total of all outstanding replenishment orders. The on order balance increases when a new order is released, and it decreases when material is received to fill an order, or when an order is cancelled. (cf. on hand, open order).

OPEN ORDER—1. An active manufacturing order or purchase order. Syn: scheduled receipt. 2. An unfilled customer order.

OPERAND—That part of a computer instruction that tells the computer where the data that is to be processed is stored.

OPERATING SYSTEM—A group of procedures for operating a computer usually including techniques for scheduling operations within the computer.

OPERATION CHART—See: route sheet.

OPERATION CODE—That part of a computer instruction that tells it what function (such as addition) to perform.

OPERATION LIST—See: route sheet.

OPERATION SHEET—See: route sheet.

OPERATION START DATE—The date when an operation should be started based upon the work remaining and the time remaining to complete the job.

OPERATION TICKET—See: work order.

OPERATIONS RESEARCH—The development and application of quantitative techniques to the solution of problems faced by managers of public and private organizations. More specifically, theory and methodology in mathematics, statistics, and computing are adapted and applied to the identification, formulation, solution, validation, implementation, and control of decision making problems.

OPERATIONS SCHEDULING—See: detailed scheduling.

OPERATIONS SEQUENCE—The sequential steps which manufacturing engineering recommends that a given assembly or part follow in its flow through the plant. For instance, operation 1 may be: -cut bar stock; operation 2 may be: -grind bar stock; operation 3 -shape; operation 4 -polish; operation 5 -inspect and return to stock. This information is normally defined on a document referred to as a route sheet.

OPPORTUNITY COST—The return on capital that could have resulted had the capital been used for some purpose other than its present use. Sometimes refers to the best alternative use of the capital; at other times to the average return from feasible alternatives.

OPTICAL CHARACTER—A printed character frequently used in utilities billing and credit applications which can be read by the machine without the aid of magnetic ink.

OPTICAL CHARACTER RECOGNITION (OCR)—A mechanized method of collecting data involving the reading of hand printed or special character fonts. If handwritten, the information must adhere to predefined rules of size, format and location on the form.

OPTICAL SCANNING—A technique for machine recognition of characters by their images. (cf. optical character recognition).

OPTIMIZATION—Achieving the best possible solution to a problem in terms of a specified objective function.

OPTION—A choice or feature offered to customers for customizing the end product. In many companies, the term "option" means a mandatory choice—the customer must select from one of the available choices. For example, in ordering a new car, the customer must specify an engine but need not necessarily select an air conditioner. (cf. accessory, attachment).

ORDER—A catch-all term which may refer to such diverse items as a purchase order, shop order, customer order, planned order.

ORDER CONTROL—Control of the progress of each customer order or stock order through the successive operations in its production cycle.

ORDER ENTRY—The process of accepting and translating what a customer wants into terms used by the manufacturer. This can be as simple as creating shipping documents for a finished goods product line, to a more complicated series of activities including engineering effort for make-to-order products.

ORDER MULTIPLES—An order quantity modifier applied after the lot size has been calculated, that increments the order quantity to a predetermined multiple.

ORDER POINT—The inventory level such that if the total stock on hand plus on order falls to or below the order point, action is taken to replenish the stock. The order point is normally calculated as: forecasted usage during the replenishment lead time plus safety stock. Syn: reorder point, trigger level. (cf. time-phased order point).

ORDER POLICY—See: lot sizing.

ORDER POLICY CODE—See: lot size code.

ORDER PREPARATION LEADTIME—The time required to analyze requirements and open order status and to create the paperwork necessary to release a purchase requisition or a work order.

ORDER PROMISING—The process of making a delivery commitment, i.e. answering the question "when can you ship?" For make-to-order products this usually involves a check of uncommitted material and availability of capacity. Syn: order dating, customer order promising.

ORDER QUANTITY MODIFIERS—Order quantities are calculated based upon one of the lot sizing rules. However it may be necessary to adjust the calculated lot size due to some special considerations. These adjustments are called order quantity modifiers. (See maximum order quantity, minimum order quantity, order multiples).

ORDER SCHEDULING—See: detailed scheduling.

ORDER UP TO LEVEL—See: target inventory level.

ORDERING COST—In calculating economic order quantities, refers to the costs which increase as the number of orders placed increases. Includes costs related to the clerical work of preparing, issuing, following and receiving orders, the physical handling of goods, inspections, and machine set-up costs, if the order is being manufactured. Syn: acquisition cost. (cf. carrying costs).

OUT-OF-POCKET COSTS—Costs which involve cash payments such as direct labor as opposed to depreciation which does not. (cf. marginal cost).

OUTLIER—A datum that falls significantly away from other data for a similar phenomenon. For example: if the average sales for some product were 10 units per month, and one month had sales of 500 units, this might be considered an outlier.

OUTPUT—1. Work being completed by a production facility. 2. The result of a computer program.

OUTPUT CONTROL—See input/output control.

OUTPUT DEVICE—The unit of a computer such as a card punch that converts electrical signals into the form used by the output device such as holes punched into cards, etc. (cf. input device).

OUTPUT STANDARD—See: performance standard.

OUTSIDE SHOP—The vendor. Used to convey the idea of an extension of the inside shop.

OVERHEAD—Costs incurred in the operation of a business which can

not be directly related to the individual products or services produced. These costs, such as light, heat, supervision, maintenance, are grouped in several pools (department overhead, factory overhead, general overhead) and distributed to units of product, or service, by some standard method such as direct labor hours, direct labor dollars, direct materials dollars. (cf. absorption costing).

OVERHEAD PERCENTAGE—The percentage applied to a labor cost to calculate the overhead cost of performing work in that work center. It is used to distribute those costs which cannot be directly related to specific products or services.

OVERLAPPED SCHEDULE—the "overlapping" of successive operations, whereby the completed portion of a job lot at one work center is processed at one or more succeeding work centers before the pieces left behind are finished at the preceding work center(s). Syn.: lap-phasing, telescoping. (cf. gapped schedule).

OVER-RUN—The quantity received from manufacturing or a vendor that is in excess of the quantity ordered.

OVER, SHORT, AND DAMAGED REPORT—A report submitted by a freight agent showing discrepancies in billing received and freight on hand.

OVERTIME—Work beyond normal established working hours which usually requires that a premium be paid to the workers.

PACKING SLIP—A document which itemizes in detail the contents of a particular package or shipment.

PAPER TAPE—A continuous strip of paper in which holes can be punched to represent data.

PARALLEL CONVERSION—A method of system implementation which overlaps with the operation of the system being replaced. It minimizes the risk consequences of a poor system.

PARALLEL SCHEDULE—Use of two or more machines or job centers to perform identical operations on a lot of material. Duplicate tooling and set-up is required.

PARAMETER—A coefficient appearing in a mathematical expression, each value of which determines the specific form of the expression. Parameters define or determine the characteristics or behavior of something, as when the "mean" and "standard deviation" are used to describe a set of data.

PARETO'S LAW—A concept developed by Vilfredo Pareto, an Italian economist, that simply says that a small percentage of a group account for the largest fraction of the effort, value, etc. For example, twenty percent of the inventory items comprise eighty percent of the inventory value. Syn: 80/20 rule. (cf. ABC classification).

PARITY BIT—See: check bit.

PARITY CHECK—A technique used by the computer to check on the validity of data as it moves from one location to another. Parity for a given computer will be either even or odd; any data which contains an odd number of bits will be given one extra check bit in an even parity computer. The computer can therefore recognize quickly whether any bit of information has been dropped or picked up as data has been moved.

PARKINSON'S LAW—A tongue-in-cheek observation that "work expands so as to fill the time available for its completion."

PART—Normally refers to a material item which is used as a component and is not an assembly or sub-assembly. (cf. component).

PART NUMBER—A number which serves to uniquely identify a component, product, or raw material. (cf. significant part numbers). Syn: stock code, product code.

PART PERIOD BALANCING (PPB)—A dynamic lot sizing technique that uses the same logic as the Least Total Cost method. The difference is that PPB employs a routine called "Look Ahead/Look Back." When the Look Ahead/Look Back feature is used, a lot quantity is calculated and before it is firmed up, the next or the previous periods' demands are evaluated to verify whether it would be economical to include them in the current lot. (cf. least total cost).

PART TYPE—A part within a bill of material may be defined, among others, as regular, phantom, or reference.

PARTIAL ORDER—Any shipment received or shipped which is less than the amount ordered.

PARTS REQUISITION—An authorization either in the form of a slip of paper or a punched card which identifies the type and quantity of parts required to be withdrawn from an inventory.

PAST DUE—An order that has not been completed on time. Syn: delinquent (cf. back order).

PEGGED REQUIREMENT—A requirement at a component level that shows the next level parent item and the source of the demand that actually created the requirement (cf. pegging).

PEGGING—In MRP, pegging displays for a given item the details of the sources of its gross requirements and/or allocations. Pegging can be thought of as "live" where-used information.

PERCENT OF FILL—A measure of the effectiveness with which the inventory management system responds to actual demand. The percent of customer orders filled off the shelf can be measured in either units or dollars. (cf. stock out percentage, shortage cost).

PERFORMANCE EFFICIENCY—A ratio, usually expressed as a percentage, of actual output to a benchmark or standard output.

PERFORMANCE STANDARD—A criterion or benchmark with which actual performance is compared.

PERIOD COSTS—All costs related to a period of time rather than a unit of product, e.g., marketing costs, property taxes.

PERIOD ORDER QUANTITY—A lot sizing technique under which the lot size will be equal to the net requirements for a given number of periods (e.g., weeks) into the future. (cf. fixed order quantity, lot-for-lot). Syn: days' supply, weeks' supply.

PERIODIC ORDER SYSTEM—See: fixed interval reorder system.

PERPETUAL INVENTORY—Usually used to describe an inventory record-keeping system where each transaction in and out is recorded and a new balance is computed. (cf. physical inventory).

PERPETUAL INVENTORY RECORD—A computer record or document on which each inventory transaction is posted so that a current record of the inventory is maintained. (cf. cumulative balance, bin tag).

PERT—Program Evaluation and Review Technique—This is a project planning technique similar to the Critical Path Method, which additionally includes obtaining a pessimistic, most likely, and optimistic time for each activity from which the most likely completion time for the project along the critical path is computed. (cf. critical path scheduling).

PHANTOM BILL OF MATERIAL—See Transient Bill of Material.

PHYSICAL DISTRIBUTION—The combination of activities associated with the movement of material, usually finished products, from the manufacturer to the customer. In many cases, this movement is made through one or more levels of field warehouses. (cf. distribution requirements planning).

PHYSICAL INVENTORY—The determination of inventory quantity by actual count. Physical inventories can be taken on a continuous, periodic, or annual basis. (cf. cycle counting).

PICK DATE—The start date of the picking activity for a work order. On this date, the system produces a list of orders due to be picked, and a pick list, tags, turnaround cards.

PICKING—The process of withdrawing from stock the components to make the products, or the finished goods to be shipped to a customer. (cf. kitting).

PICKING LIST—A document which is used by operating personnel to pick manufacturing or shipping orders.

PICO-SECOND—One-trillionth of a second. (cf. micro-second).

PIECE PARTS—Consists of individual items in inventory at the simplest level in manufacturing. For example, bolts and washers. (cf. elemental parts).

PIECE RATE—The amount of money paid for a unit of production. It serves as the basis for determining the total pay for an employee working in a piece work system.

PIECE WORK—Work done on a piece rate.

PILOT LOT—A relatively small preliminary order for a product. The

purpose of the small lot is to correlate the product design with the development of an efficient manufacturing process.

PILOT PLANT—Small-scale production facilities used to develop production processes and to manufacture small quantities of new products for field testing, etc. Syn: semi-works.

PIPELINE INVENTORY—See: base pipeline stock.

PLANNED ORDER—A suggested order quantity and due date created by MRP processing, when it encounters net requirements. Planned orders are created by the computer; exist only within the computer; and may be changed or deleted by the computer during subsequent MRP processing if conditions change. Planned orders at one level will be exploded into gross requirements for components at the next lower level. Planned orders also serve as input to capacity requirements planning, along with released orders, to show the total capacity requirements in future time periods.

PLANNER/BUYER—See: vendor scheduler.

PLANNING BILL (OF MATERIAL)—An artificial grouping of items, in bill of material format, used to facilitate master scheduling and/or material planning. (cf. common parts bill, modular bill, super bill).

PLANNING BOARD—See: control board.

PLANNING HORIZON—In a MRP system, the planning horizon is the span of time from the current to some future date for which material plans are generated. This must cover at least the cumulative purchasing and manufacturing lead time, and usually is quite a bit longer.

PLOTTER—Device for presenting computer output in graphical form instead of a printed listing.

POISSON DISTRIBUTION—This is a statistical distribution similar to the normal distribution except that the standard deviation is equivalent to the square root of the mean.

POLYNOMIAL—An algebraic expression that contains two or more terms. The dependent variable is represented by a linear combination of powers of the independent variables with the degree of the polynomial determined by the highest power in the expression.

POPULATION—The entire set of items from which a sample is drawn.

POST-DEDUCT INVENTORY TRANSACTION PROCESSING—A method of doing inventory bookkeeping where the book (computer) inventory of components is reduced only after completion of activity on their upper-level parent or assembly. This approach has the disadvantage of a built-in differential between the book record and what is physically in stock. (cf. direct-deduct inventory transaction processing, pre-deduct inventory transaction processing).

PRE-DEDUCT INVENTORY TRANSACTION PROCESSING—A method of doing inventory bookkeeping where the book (computer) inventory of components is reduced prior to issue, at the time a scheduled receipt for their parent or assembly is created. This approach has the disadvantage of a built-in differential between the book record and what is physically in stock. (cf. direct-deduct inventory transaction processing, post-deduct inventory transaction processing).

PREDETERMINED MOTION TIME—There are several systems of motion times which list all motions that a human can perform in accomplishing factory or office tasks and a standard performance time for making each of the motions. The most widely used system is methods time measurement (MTM). (cf. time standard).

PREDICTION—An intuitive estimate of demand taking into account changes and new factors influencing the market; as opposed to a forecast, which is an objective projection of the past into the future. (cf. forecast).

PRE-EXPEDITING—The function of following up an open orders before the scheduled delivery date, to ensure the timely delivery of materials in the specified quantity.

PREPAID—A term denoting that transportation charges have been or are to be paid at the point of shipment.

PRE-SCHEDULING—A scheduling technique used where the amount of time to be allowed for each operation is calculated once and then as each order is received or as the due date or start date changes,

the schedule can be recalculated without having to refer to the scheduling rules. (cf. scheduling rules).

PRESENT VALUE—The value today of future cash flows. For example: the promise of ten dollars a year from now is worth something less than ten dollars in hand today. (cf. discounted cash flow).

PRICE PREVAILING AT DATE OF SHIPMENT—An agreement between the purchaser and the vendor that the price of the goods ordered is subject to change at the vendor's discretion between the date the order is placed and the date the vendor makes shipment and that the then-established price is the contract price.

PRICE PROTECTION—An agreement by a vendor with a purchaser to grant the purchaser any reduction in price which the vendor may establish on his goods prior to shipment of the purchaser's order or to grant the purchaser the lower price should the price increase prior to shipment. Price protection is sometimes extended for an additional period beyond the date of shipment.

PRICE SCHEDULE—The list of prices applying to varying quantities or kinds of goods.

PRIMARY STORAGE—The "memory" of a computer where instructions and data being worked upon are contained. Most primary storage today is made up of small iron rings or cores which can be electrically charged; therefore, primary storage is often called core storage. Syn: main storage.

PRIME COSTS—Direct costs of material and labor, does not include general sales and administrative costs.

PRIME OPERATIONS—Critical or most significant operations whose production rates must be planned. Sometimes referred to as "pinch points" in the shop, gateway operations, key work centers, bottlenecks.

PRIORITY—In a general sense, refers to the relative importance of jobs, i.e. which jobs should be worked on and when. It is a separate concept from capacity. (cf. capacity, scheduling).

PRIORITY RULES—Rules that are given to the dispatcher or foreman so that a decision can be made on which job to do next. (cf. dispatching rule).

PROBABILITY—Mathematically, a number between 0 and 1 that estimates the fraction of experiments (if the same experiment were being repeated many times) in which a particular result would occur. This number can either be a subjective guess or it can be based upon the empirical results of some experimentation. It can also be derived for a process so as to give the probable outcome of experimentation. (cf. expected value).

PROBABILITY DISTRIBUTION—A table of numbers or a mathematical expression which indicates the frequency with which each of all possible results of an experiment should occur.

PROBABILITY TREE—See: Decision Tree.

PROCEDURE MANUAL—A formal organization and indexing of a firm's policies and practices. They are usually printed and distributed to the appropriate functional areas.

PROCEDURES—Definitions of approved methods of administrative operations.

PROCESS CHART—A graphic representation of events occurring during a series of actions or operations and of information pertaining to those operations. Syn: flow chart.

PROCESS COST SYSTEM—A costing system in which the costs are collected by time period and averaged over all the units produced during the period. This system can be used with either actual or standard costs in the manufacture of large number of identical units. (cf. job order costing).

PROCESS INDUSTRIES—Businesses which add value to materials by mixing, separating, forming or chemical reactions. Processes may be either continuous or batch and usually require rigid process control and high capital investment.

PROCESS SHEET—Detailed manufacturing instructions issued to the shop. The instructions may include speeds, feeds, tools, fixtures, machines, and sketches of setups and semi-finished dimensions (cf. routing).

PROCESS TIME—The time during which the material is being changed, whether it is a machining operation or a hand assembly. Syn: residence time.

PROCESSOR PROGRAM—A software program used to convert computer instructions written in symbolic language into absolute language. Assemblers and compilers are both processors; assemblers usually convert one symbolic instruction into one machine instruction while a compiler can convert one symbolic instruction into a number of machine instructions.

PROCUREMENT CYCLE—See: procurement lead time.

PROCUREMENT LEADTIME—The time required by the buyer to select a supplier, and to place and obtain a commitment for specific quantities of material at specified times. (cf. purchasing lead time).

PRODUCT—Any commodity produced for sale. (cf. material).

PRODUCT COSTING—See: job order costing.

PRODUCT GROUP FORECAST—A forecast for a number of similar products.

PRODUCT LAYOUT—See: continuous production.

PRODUCT LOAD PROFILE—A statement of the key resources required to manufacture one unit of a selected item. Often used to predict the impact of the item scheduled in the master production schedule on these resources. Syn: bill of labor, bill of resources, resource profile.

PRODUCT MIX—The combination of individual product types and the volume produced that make up the total production volume. Changes in the product mix can mean drastic changes in the manufacturing requirements for certain type of labor and material. (cf. sales mix).

PRODUCT STRUCTURE—The way components go into a product during its manufacture. A typical product structure would show, for example, raw material being converted into fabricated components, components being put together to make subassemblies, subassemblies going into assemblies, etc.

PRODUCT STRUCTURE RECORD—A computer record defining the relationship of one component to its immediate parent and containing fields for quantity required, engineering effectivity, scrap factor, application selection switches, etc.

PRODUCTION CONTROL—The function of directing or regulating the movement of goods through the entire manufacturing cycle from the requisitioning of raw materials to the delivery of the finished product. (cf. inventory control).

PRODUCTION CYCLE—The lead time to produce a product. (cf. cycle).

PRODUCTION FORECAST—See: production planning.

PRODUCTION LEAD TIME—See: manufacturing cycle.

PRODUCTION LEVELS—See: production rates.

PRODUCTION MATERIAL—Any material used in the manufacturing process.

PRODUCTION MATERIALS REQUISITION—An authorization either in the form of a slip of paper, punched card, or CRT transaction which identifies the type and quantity of materials to be purchased or withdrawn from stores. Syn: material order, materials requisition.

PRODUCTION ORDER—See: manufacturing order.

PRODUCTION PLAN—The agreed upon strategy that comes from the production planning function. (cf. production planning).

PRODUCTION PLANNING—The function of setting the overall level of manufacturing output. It's prime purpose is to establish production rates that will achieve management's objective in terms of raising or lowering inventories or backlogs, while usually attempting to keep the production force relatively stable. The production plan is usually stated in broad terms (e.g. product groupings, families of products). It must extend through a planning horizon sufficient to plan the labor, equipment, facilities, material, and finances required to accomplish the production plan. Various units of measure are used by different companies to express the plan such as standard hours, tonnage, labor operators, units, pieces, dollars, etc. As this plan affects all company functions, it is nor-

mally prepared with information from marketing, manufacturing, engineering, finance, materials, etc. In turn, the production plan becomes management's authorization for the Master Scheduler to convert into a more detailed plan. Syn: production program. (cf. business plan, closed-loop MRP).

PRODUCTION RATES—The quantity of production usually expressed in units, hours, or some other broad measure, expressed by a period of time i.e. per hour, per shift, day, week, etc. Syn: production levels. (cf. production planning).

PRODUCTION RELEASE—See: manufacturing order.

PRODUCTION REPORT—A formal, written statement giving information on the output of an organization or one or more of its subdivisions for a specified period. The information normally includes the type and quantity of output; workmen's efficiencies; departmental efficiencies; costs of direct labor, direct material, and the like; overtime worked; and machine downtime.

PRODUCTION SCHEDULE—A plan which authorizes the factory to manufacture a certain quantity of a specific item. Usually initiated by the production planning department. (cf. shop order, work order, manufacturing order, job order).

PRODUCTION STANDARD—Time standards to produce piece parts and assemblies.

PRODUCTIVITY—Refers to a relative measure of output per labor or machine hour.

PROGRAMMABLE CONTROLLER—A device or transmission control unit in which hardwired functions have been replaced with software or microcode, so that capabilities can be added, changed, or tailored to the user's needs.

PROGRESS PAYMENTS—Payments arranged in connection with purchase transactions requiring period payments in advance of delivery for certain amounts or for certain percentages of the purchase price. The whole of the purchase price may be due in advance of delivery or partially after delivery.

PROJECT EVALUATION AND REVIEW TECHNIQUE—See: PERT.

PROJECT MODEL—A time-phased project planning and control system which itemizes major milestones and points of user approval.

PROJECTED AVAILABLE BALANCE—In MRP, the inventory balance projected out into the future. It is the running sum of on hand inventory minus requirements plus scheduled receipts.

PROJECTED FINISH DATE—The date at which a stop order will be completed; calculated by using the scheduling rules and today's date. By subtracting the required completion date from the projected finish date, one can define how early or late a job is running and use that to determine relative priority between jobs. For example:

Today's Date	562
Days to Complete	+ 41
Projected Finish Date	603
Required Date	- 580
Days Late	23

In the example, the job is projected as finishing 23 days late and should have priority over jobs projected as finishing closer (their due date).

PROJECTION—Estimation based on past data. Syn: extrapolation.

PROMOTIONAL PRODUCT—A product that is subject to wide fluctuations in sales because it is usually sold at a reduced price or with some other sales incentive. (cf. judgement items).

PROTECTION TIME—A number of days used as a safety buffer between the date demands are due and supply orders are to be completed.

PROTECTIVE INVENTORY—See: safety stock.

PSEUDO BILL (OF MATERIAL)—See: planning bill.

PULL DISTRIBUTION SYSTEM—a system for replenishing field warehouse inventories wherein replenishment decisions are made at the field warehouse itself, not at the central supply warehouse or plant. (cf. push distribution system).

PURCHASE ORDER—The purchaser's document used to formalize a

purchase transaction with a vendor. A purchase order, when given to a vendor, should contain statements to the quantity, description, and price of the goods or services ordered; agreed terms as to payment, discounts, date of performance, transportation terms, and all other agreements pertinent to the purchase and its execution by the vendor.

PURCHASE PART—A part purchased from a vendor.

PURCHASE PART VARIANCE—The difference in price between what was paid to the vendor and the standard cost of that item.

PURCHASE REQUISITION—A document conveying authority to the procurement department to purchase specified materials in specified quantities within a specified time.

PURCHASING AGENT—The person authorized by the company to purchase goods and services for the company.

PURCHASING CAPACITY—The act of buying capacity or machine time from a vendor. This allows a company to use and schedule the capacity of the machine or a part of the capacity of the machine as if it were in their own shop.

PURCHASING LEADTIME—The total lead time required to obtain a purchased item. Included here are procurement leadtime, vendor leadtime, transportation time, receiving, inspection and put away time.

PUSH DISTRIBUTION SYSTEM—A system for replenishing field warehouse inventories wherein replenishment decision-making is centralized, usually at the manufacturing site or central supply facility. (cf. distribution requirements planning, pull distribution system).

Q

QUANTITY DISCOUNT—An allowance determined by the quantity or value of a purchase.

QUANTITY PER—The quantity of a component to be used in the production of its parent. Quantity per is used when calculating the gross requirements for components.

QUEUE—A waiting line. In manufacturing, the jobs at a given work center waiting to be processed. As queues increase, so do average queue time and work-in-process inventory.

QUEUE TIME—The amount of time a job waits at a work center before set-up or work is performed on the job. Queue time is one element of total manufacturing lead time. Increases in queue time result in direct increases to manufacturing lead time.

QUEUEING THEORY—The collection of models dealing with waiting line problems; i.e., problems for which customers or units arrive at some service facility at which waiting lines or queues may build. Syn: waiting line theory.

QUOTATION—A statement of price, terms of sale, and description of goods or services offered by a vendor to a prospective purchaser; a bid. When given in response to an inquiry is usually considered an offer to sell.

QUOTATION EXPIRATION DATE—The date at which time a quotation price is no longer valid.

R

RANDOM—Having no predictable pattern. For example, sales data may vary randomly about some forecasted value with no specific pattern and no attendant ability to obtain a more accurate sales estimate than the forecast value.

RANDOM ACCESS—A term used to describe files which do not have to be searched sequentially to find a particular record but can be addressed directly. (cf. sequential access).

RANDOM DISPATCHING RULE—The sequencing of jobs to be run on some basis which is unrelated to a measure of effectiveness for that operation. For example, an operator may choose to run those jobs which have the loosest time standards.

RANDOM NUMBERS—A sequence of integers or group of numbers (often in the form of a table) which show absolutely no relationship to each other anywhere in the sequence. At any point, all integers have an equal chance of occurring, and they occur in an unpredictable fashion.

RANDOM SAMPLE—A selection of observations taken from all of the observations of a phenomenon in such a way that each chosen observation has the same possibility of selection. (cf. sampling).

RANDOM VARIATION—A fluctuation in data which is due to uncertain or random occurrences.

RANGE—The statistical term referring to the spread in a series of observations. For example, the range of anticipated demand for a particular product might range from 10 to 500 per week. The range would, therefore be 490.

REAL TIME DATA PROCESSING—The processing of transactions as they occur rather than batching them. (cf. on-line processing).

RECEIVING—This function includes the physical receipt of material; the inspection of the shipment for conformance with the purchase order (quantity and damage); identification and delivery to destination; and preparing receiving reports.

RECEIVING POINT—Location to which material is being shipped (cf. shipping point).

RECEIVING REPORT—A form used by the receiving function of a company to inform others of the receipt of goods purchased.

RECONCILING INVENTORY—Comparing the physical inventory figures with the perpetual inventory record and making any necessary corrections.

RECOVERY—Restoration of normal processing after hardware or software malfunction through detailed procedures for file backup, file restoration, and transaction logging.

REGEN—Slang abbreviation for regeneration material planning.

REGENERATION MRP—An approach where the master production schedule is totally re-exploded down through all bills of material, at least once per week to maintain valid priorities. New requirements and planned orders are completely "regenerated" at that time. (cf. net change MRP, requirements alteration).

REGISTER—A special section of primary storage in a computer where data is held while it is being worked on.

REGRESSION ANALYSIS—Models for determining the mathematical expression that best describes the functional relationship between two or more variables. Regression models are often used in forecasting.

REJECTED INVENTORY—Inventory which does not meet quality requirements but has not yet been sent to rework, scrapped, or returned to a vendor.

REJECTION—The act of rejecting an item by the buyer's receiving inspection as not meeting the purchase quality specification.

REJECTION (DISCRIMINATION) ACCURACY—The degree to which voice recognition equipment will not accept unwanted or invalid inputs, including extraneous noise, thereby allowing operation in a high-noise environment.

RELEASE—The authorization to produce or ship material which has already been ordered. (cf. blanket order).

RELEASED ORDER—See: Open order.

REMOTE/LOCAL—Refers to device connection to a given computer, with remote devices being attached over communications lines and local devices attached directly to a computer channel; in a network environment, the computer itself may be a remote device to the CPU controlling the network.

REORDER CYCLE—See: procurement lead time.

REORDER POINT—See: order point.

REORDER QUANTITY—In a fixed order system of inventory control, the fixed quantity which should be ordered each time the available stock (on hand plus on order) falls below the order point. However, in a variable reorder quantity system the amount ordered from time

period to time period will vary. (cf. economic order quantity, lot size). Syn: replenishment order quantity.

REPAIR ORDER—1. See: rework order. 2. An order for repair parts.

REPAIR PARTS—See: Service Parts.

REPAIR PARTS DEMAND—See: Service Parts Demand.

REPLACEMENT ORDER—A manufacturing order for the replacement of material that has been scrapped during a production cycle.

REPLENISHMENT LEAD TIME—The total period of time that elapses from the moment it is determined that a product is to be reordered until the product is back on the shelf available for use.

REPLENISHMENT ORDER QUANTITY—See: reorder quantity.

REPLENISHMENT PERIOD—See: replenishment lead time.

REPROMISE DATE—Revised delivery date obtained from the supplier based upon expediting the original contract delivery date.

REQUIREMENTS ALTERATION—Processing a revised master production schedule through MRP in order to review the impact of the changes. Not to be confused with net change, which, in addition to changes to the MPS, also processes changes to inventory balances, bills of material, etc. through MRP. Syn: alteration planning. (cf. net change MRP, regeneration MRP).

REQUISITION—See: parts requisition, purchase requisition, production materials requisition.

RESCHEDULING—The process of changing order or operation due dates, usually as a result of their being out of phase with when they're needed.

RESCHEDULING ASSUMPTION—A fundamental piece of MRP logic which assumes that existing open orders can be rescheduled in to nearer time periods far more easily than new orders can be released and received. As a result, planned order receipts are not created until all scheduled receipts have been applied to cover gross requirements.

RESERVATION—The process of designating stock for a specific customer order. (cf. allocation).

RESERVE STOCK—See: safety stock.

RESERVED MATERIAL—Material on hand or on order which is assigned to specific future production orders. Syn: assigned material, allocated material, mortgaged material, obligated material. (cf. available material).

RESOURCE PLANNING—See: long-range resource planning.

RESOURCE PROFILE—See: product load profile.

RESOURCE REQUIREMENTS PLANNING—The process of converting the production plan and/or the master production schedule into the impact on key resources, such as man hours, machine hours, storage, standard cost dollars, shipping dollars, inventory levels, etc. Product load profiles or bills of resources could be used to accomplish this. The purpose of this is to evaluate the plan prior to attempting to implement it. Sometimes referred to as a rough-cut check on capacity. Capacity requirements planning is a detailed review of capacity requirements. Syn: rough-cut capacity planning, rough-cut resource planning. (cf. closed-loop MRP).

RESPONSE TIME—The amount of time between release of an input message for processing (typically by pressing the ENTER key on a terminal) and receipt of the response to that message at the originating terminal.

RESTART—Resuming execution of an interrupted program at the point of interruption, commonly done by taking status checkpoints during execution and then specifying during rerun the particular checkpoint at which to resume.

RETAIL METHOD—A special method of inventory evaluation in which the value is determined by applying a predetermined percentage to the inventory value specified at retail prices. (cf. inventory valuation).

RETURN TO VENDOR—Material that has been dispositioned, rejected by the buyer's inspection department and is awaiting shipment back to the supplier for repair or replacement.

REVIEW PERIOD—The time between successive evaluations of inventory status to determine whether or not to reorder. (cf. leadtime).

REWORK LEADTIME—The time required to rework a lot of material in house or at a supplier.

REWORK ORDER—A manufacturing order to rework and salvage defective parts or products. Syn.: repair order, spoiled work order.

ROUGH CUT RESOURCE PLANNING—See: resource requirements planning.

ROUTE SHEET—A document which specifies the operations on a part and the sequence of these operations, with alternate operations and routings wherever feasible; prepared by process engineers at the time the part was first put into production. Other processing specifications that can be included on a route sheet are the material requirements (kind and quantity), machining tolerances, the tools, jigs and fixtures required, and the time allowance for each operation. Syn: operation list, operation sheet or chart, process chart, manufacturing data sheet. (cf. bill of materials).

ROUTING—A document for the manufacture of a particular item, the sequence of operations, transportations, storages, and inspections to be used and usually the standard times applicable, and the machines, equipment, tools, work centers, number of workmen, and materials that are required. Syn.: operation list, route sheet, operation sheet or chart, process chart, manufacturing data sheet.

RPG—A computer language which can be used on several computers. The language stresses complete output reports based upon information which describes the input files, operations, and output format. RPG is an acronym for Report Program Generator. (cf. COBOL, FORTRAN).

RUN ORDER—See: Fabrication Order.

RUNNING TIME—The time during which a machine is actually producing product. For example, the running time for a machine tool would include time cutting metal and the time moving into position to cut metal, but running time would not include set up, maintenance, waiting for the operator. (cf. idle time).

RUN-OUT LIST—A list of items to be scheduled into production in sequence by the dates at which the present available stock is expected to be exhausted.

RUN SHEET—A log-type document used in continuous processes to record raw materials used, quantity produced, in-process testing results, etc. May serve as an in-put document for inventory records.

RUN-TIME—The standard hours allowed to produce one item on the operation. The actual time taken to produce one piece may vary from the standard but the latter is used for loading purposes and is adjusted to actual by dividing by the appropriate work center efficiency factor.

RUSH ORDER—An order which for some reason must be fulfilled in less than normal lead time.

S

SAFETY CAPACITY—The planning or reserving for excess manpower and equipment above known requirements for unexpected demand. This reserve capacity is in lieu of safety stock. Syn.: reserved capacity procurement.

SAFETY STOCK—1. In general, a quantity of stock planned to be in inventory to protect against fluctuations in demand and/or supply. 2. The average amount of stock on hand when a replenishment quantity is received. 3. In the context of Master Production Scheduling, safety stock can refer to additional inventory and/or capacity planned as protection primarily against forecast errors and/or short term changes in the backlog. This investment is often under the control of the master scheduler in terms of where it should be planned. Sometimes referred to as "Overplanning" or a "Market Hedge." (cf. hedge).

SAFETY TIME—In an MRP system, material can be ordered to arrive ahead of the requirement date. The difference between the requirement date and the planned in-stock date is safety time. (cf. safety stock).

SALES MIX—The combination individual product types and their sales volume that make up the total sales volume. Differences between sales mix and product mix are the results of changes in inventory or backlog. (cf. product mix).

SALES ORDER NUMBER—A unique control number assigned to each new customer order, usually during order entry. It is often used by order promising, master scheduling, cost accounting, invoicing etc. For some make-to-order products it can also take the place of an end item part number by becoming the control number that is scheduled through the final assembly operation.

SAMPLE—A portion of a universe of data chosen to estimate some characteristic(s) about the whole universe. The universe of data could consist of historical delivery cycles, unit costs, sizes of customer orders, number of units in inventory, etc. (cf. sampling distribution).

SAMPLING—A statistical process whereby generalizations regarding an entire body of phenomena are drawn from a relatively small number of observations. (cf. sampling distribution).

SAMPLING DISTRIBUTION—The distribution of values of a statistic calculated from samples of a given size.

SATISFICING LEVEL—A level of performance for which one is willing to settle even though it is not the maximum or best performance level. (cf. suboptimization).

SAW-TOOTH DIAGRAM—A quantity vs. time graphic representation of the order point/order quantity inventory system showing inventory being received and then used up and reordered.

SCATTER CHART—A graph showing the actual observed relationships between two variables by the use of plotted points. (cf. correlation).

SCHEDULE—A listing of jobs to be processed through a work center, department, or plant and their respective start dates as well as other related information.

SCHEDULE BOARD—See: control board.

SCHEDULE CHART—See: control chart.

SCHEDULED RECEIPTS—Within MRP, open production orders and open purchase orders are considered as "scheduled receipts" on their due date and will be treated as part of available inventory during the netting process for the time period in question. Scheduled receipt dates and/or quantities are not normally altered automatically by the MRP system. Further, scheduled receipts are not exploded into requirements for components as MRP logic assumes that all components required for the manufacture of the item in question have been either allocated or issued to the shop floor. (cf. planned order, firm planned order).

SCHEDULING—Establishing the timing for performing a task. There are various levels of scheduling within a manufacturing company. The master schedule establishes the overall logistics plan for supplying material to support production and sales. Material requirements are generated, and scheduled due dates are established for this material to support the master production schedule. Shop orders may be broken down into more detailed schedules for each operation and desired completion (or start) dates for each of these operations established to show when they must be completed in order to get the shop order completed on time. (cf. master production schedule, detailed scheduling, dispatching, priority).

SCHEDULING RULES—Basic rules that are spelled out ahead of time so that they can be used consistently in a scheduling system. Scheduling rules usually specify the amount of calendar time to allow for a move and for queue, how load will be calculated, etc. (cf. block scheduling).

SCIENTIFIC COMPUTERS—A computer designed to process large quantities of data and computations with limited input and output. It has high speed arithmetic capabilities using the binary system and floating point registers.

SCIENTIFIC INVENTORY CONTROL—The use of statistical techniques to determine inventory levels, establish reordering procedures, etc.

SCRAP FACTOR—A percentage factor in the product structure used to increase gross requirements to account for anticipated loss

within the manufacture of a particular product, not all uses of this component. (cf. shrinkage factor).

SCRAP RATE—The percentage difference between the amount or number of units of product which is started in a manufacturing process and that amount or number of units which is completed at an acceptable quality level. Syn.: shrinkage.

SEARCH MODELS—Operations research models that attempt to find optimal solutions with adaptive searching approaches.

SEASONAL—Daily, weekly, or monthly sales data that shows a repetitive pattern from year to year with some periods considerably higher than others. (cf. base series, anticipation inventories).

SEASONAL HARMONICS—See: harmonic smoothing.

SEASONAL INDEX—See: base series.

SEASONAL INVENTORY—Inventory built up in anticipation of a peak season in order to smooth production. (cf. anticipation inventories).

SECOND ORDER SMOOTHING—A method of exponential smoothing for trend situations that employs two previously computed averages, the singly and doubly smoothed values, to extrapolate into the future. Syn.: double smoothing.

SECULAR TREND—The general direction of the long-run change in the value of a particular time series.

SELLER'S MARKET—A seller's market is considered to exist when goods cannot easily be secured and when the economic forces of business tend to cause goods to be priced at the vendor's estimate of value.

SEMI-FINISHED GOODS—Products which have been stored uncompleted awaiting final operations which adapt them to different uses or customer specifications.

SEMI-PROCESS FLOW—A manufacturing configuration where most jobs go through the same sequence of operations even though production is in job lots.

SEMI-WORKS—See: pilot plant.

SEND-AHEAD—See: split lot.

SENSORS—Devices which can monitor and adjust differences in voltage in order to control sophisticated machinery on a dynamic basis.

SEQUENCING—Determining the order in which a manufacturing facility is to process a number of different jobs in order to achieve certain objectives. (cf. dispatching).

SEQUENTIAL—In numeric sequence, normally in ascending order.

SEQUENTIAL ACCESS—A term used to describe files such as magnetic tape which must be searched sequentially to find any desired record. (cf. random access).

SERVICE FUNCTION—A mathematical relationship of the safety factor to service level, i.e., to the fraction of demand that is routinely met from stock. (cf. customer service ratio).

SERVICE LEVELS—See: customer service ratio.

SERVICE PARTS—Parts used for the repair and/or maintenance of an assembled product. Typically they are ordered and shipped at a date later than the shipment of the product itself.

SERVICE PARTS DEMAND—The need for a component to be sold by itself, as opposed to being used in production to make a higher level product. Syn: repair parts demand, spare parts.

SERVICE TIME—The time required to serve the customer (i.e., fill his demand) after he places demand on an inventory. (cf. cycle).

SERVICE VS. INVESTMENT CHART—A curve showing the amount of inventory that will be required to give various levels of customer service. (cf. standard ratio).

SERVO SYSTEM—A control mechanism linking a system's input and output, designed to feed back data on system output to regulate the operation of the system. (cf. feedback).

SET-UP COST—The out-of-pocket costs associated with a machine set-up (order) that would increase or decrease if the number of set-ups (orders) were increased or decreased. Syn: change-over cost.

SETUP LEAD TIME—The time in hours or days needed to prepare before a manufacturing process can start. Setup time may include run and inspection time for the first piece.

SET-UP TIME—Time required to adjust a machine or line and attach

the proper tooling to make a particular product. (cf. idle time). Syn: start-up time.

SHIP-AGE LIMIT—The date after which a product cannot be shipped to a customer. (cf. final ship date).

SHIPPING—This activity provides facilities for the outgoing shipment of parts, products, and components. Packaging, marking, weighing, and loading for shipment is part of this activity.

SHIPPING LEAD TIME—The number of working days normally required for goods in transit between a shipping and receiving point, plus acceptance time in days at the receiving point (cf. Transit Time).

SHIPPING ORDER DEBIT MEMO—Document used to authorize the shipment of rejected material back to the supplier and create a debit entry in accounts payable.

SHIPPING POINT—The location from which material is shipped.

SHIPPING TOLERANCE—An allowable tolerance the vendor can ship over or under your contract quantity. Usually plus or minus ten percent is the allowable shipping tolerance and the contract is considered closed and complete if the vendor ships within this tolerance.

SHOP FLOOR CONTROL—A system for utilizing data from the shop floor as well as data processing files to maintain and communicate status information on shop orders and work centers. The major subfunctions of shop floor control are: 1. Assigning priority to each shop order. 2. Maintaining WIP quantity information for MRP. 3. Conveying shop order status information to the office. 4. Providing actual output data for capacity control purposes. (cf. closed-loop MRP).

SHOP ORDER—See: manufacturing order.

SHOP PACKET—A manufacturing order that travels with the job and includes a group of documents like the routings, blueprint, materials requisitions, move tickets, time tickets, etc. Usually many of the documents are in the form of punched cards. (cf. traveler).

SHOP PLANNING—The coordination of material handling, material availability, the set-up and tooling availability so that a job can be done on a particular machine. Shop planning is often part of the dispatching function and the term shop planning is sometimes used interchangeably with dispatching although dispatching does not have to necessarily include shop planning. For example, the selection of jobs might be handled by the centralized dispatching function while the actual "shop planning" might be done by the foreman or one of his representatives. (cf. dispatching, closed-loop MRP).

SHOP SCHEDULING—See: detailed scheduling.

SHOP TRAVELER—See: traveler.

SHORTAGE COST—The marginal profit that is lost when a customer ordered an item but it was not immediately available in stock. Care must be taken to isolate all of the additional profit that would have occurred had the item been sold at the time it was required. Likewise, a customer whose demand is not satisfied may, in the future, reduce his potential demand for the item. (cf. percent of fill).

SHORTEST PROCESS TIME RULE—A dispatching rule which directs the sequencing of jobs in ascending order by processing time. Following this rule, the most jobs per time period will be processed. As a result, the average lateness of jobs is minimized, but some jobs will be very late. (cf. due date rule, slack time rule, random dispatching rule).

SHRINKAGE—Reductions of material quantities of items in stock, in process, in transit. The loss may be caused by scrap, theft, deterioration.

SHRINKAGE FACTOR—A percentage factor in the Item Master which compensates for expected loss during the manufacturing cycle either by increasing the gross requirements or by reducing the expected completion quantity of planned and open orders. The shrinkage factor differs from the scrap factor in that the former affects all uses of the part and its components. The scrap relates to only one usage. (cf. scrap factor).

SHRINKAGE RATE—See: Shrinkage factor.

SIGMA—A common designation for the standard deviation which is a measure of the dispersion of data or the spread of the distribution. (cf. standard deviation).

SIGNIFICANT PART NUMBERS—Part numbers that are intended to convey certain information such as the source of the part, the material in the part, the shape of the part, etc. (cf. non-significant part numbers).

SIMPLEX ALGORITHM—A procedure for solving the general linear programming problem.

SIMULATION—The technique of utilizing representative or artificial data to reproduce in a model various conditions that are likely to occur in the actual performance of a system. Frequently used to test the behavior of a system under different operating policies. (cf. Monte Carlo technique, model).

SINGLE-LEVEL BILL OF MATERIAL—A single level bill shows only those components that are directly used in an upper-level item. It does not show any relationships more than one level down.

SINGLE-LEVEL WHERE USED—Single level where used for a component lists each assembly in which that component is directly used and in what quantity. This information is usually made available through the technique known as "implosion."

SINGLE SMOOTHING—See: first order smoothing.

SIXTY-DAY ORDERING RULE—A periodic ordering technique where inventory is reviewed and the amount on hand and on order is brought up to the equivalent of 60 days' normal sales. (cf. min-max system).

SKEW—The degree of a non-symmetry shown by a frequency distribution. (cf. bias).

SKU—See: stockkeeping unit.

SLACK—See: slack time.

SLACK TIME—The difference in calendar time between the scheduled due date for a job and the estimated completion date. If a job is to be completed ahead of schedule, it is said to have slack time; if it is likely to be completed behind schedule, it is said to have negative slack time. Slack time can be used to calculate job priorities using methods such as the Critical Ratio. In the Critical Path Method, total slack is the amount of time a job may be delayed in starting without necessarily delaying the project completion time. Free slack is the amount of time a job may be delayed in starting without delaying the start of any other job in the project. (cf. critical ratio, critical path scheduling).

SLACK TIME RULE—A dispatching rule which directs the sequencing of jobs based on $(\text{DAYS LEFT} \times \text{HR/DAY}) - \text{STD. HR LEFT} = \text{PRIORITY}$, or $(5 \times 8) - 12$ equals 28.

SLOW MOVING ITEMS—Those items in inventory which have infrequent rather than constant demand. For these items, the important aspect of the forecast is when there will be demand rather than what will the demand be.

SMALLEST PROCESS TIME RULE—See: shortest process time rule.

SMART TERMINAL—See: intelligent terminal.

SMOOTHING—Averaging by a mathematical process or by curve fitting, such as the method of least squares or exponential smoothing.

SMOOTHING CONSTANT—In exponential smoothing, the weighting factor which is multiplied against the most recent error. Syn: alpha.

SOFTWARE—The processor programs, library routines, manuals, and other service programs supplied by a computer manufacturer to facilitate the use of a computer. In addition, it may refer to other programs specially developed to fit the users' needs. (cf. hardware).

SOURCE DOCUMENT—An original record of some type which is to be converted into machine readable form.

SOURCE PROGRAM—A computer program written in symbolic language which will be converted into an absolute language object program using a processor program.

SPARE PARTS—See: service parts.

SPARE PARTS DEMAND—See: service parts demand.

SPEAKER DEPENDENT—Class of voice-operated hardware using pattern recognition techniques, requires operator to first give equipment a sample of speech patterns before words can be recog-

nized; equipment capabilities range from word recognizers to intelligent voice terminals.

SPEAKER IDENTIFICATION—An area of application wherein a previously spoken utterance is processed and analyzed according to its acoustic components for the purpose of isolating one from a group of speakers, not unlike fingerprint matching.

SPEAKER VERIFICATION—An area of voice equipment applications wherein the speaker's voice pattern is matched to previously entered patterns in storage to verify and authorize the speaker; typical usage is for facility access controls.

SPECIAL—Refers to a part or group of parts which are unique to a particular order. (cf. common parts).

SPECIFICATION—A clear, complete, and accurate statement of the technical requirements descriptive of a material, an item, or a service, and of the procedure to be followed to determine if the requirements are met.

SPLIT DELIVERY—A method by which a larger quantity is ordered on a purchase order to secure a lower price, but delivery is spread out over several dates to control inventory investment.

SPLIT LOT—A manufacturing order quantity that has been divided into two or more smaller quantities usually after the order is in process. Lots are sometimes split so that a portion of the lot can be moved through manufacturing faster. This portion is called the send-ahead.

SPOILED WORK ORDER—See: rework order.

SPT—See: shortest process time rule.

STABILIZATION STOCK—This is inventory that is carried on hand above the base inventory level to provide some protection against recurring overtime or downtime. (cf. organization inventories).

STAGED MATERIAL—See: layout.

STAGING—Pulling of the material requirements for an order from inventory before the material is required. This action is taken as a protection from inaccurate inventory records, but leads to increased problems in inventory records and availability.

STANDARD ALLOWANCE—The established or accepted amount by which the normal time for an operation is increased within an area, plant, or industry to compensate for the usual amount of fatigue and/or personal and/or unavoidable delays.

STANDARD COST SYSTEM—A cost system which uses cost units determined before production. For management control purposes, the standards are compared to actual costs and variances are computed. (cf. actual cost system).

STANDARD COSTS—The normal expected cost of an operation, process, or product including labor, material, and overhead charges, computed on the basis of past performance costs, estimates, or work measurement.

STANDARD DEVIATION—A measure of dispersion of data or of a variable. The standard deviation is computed by finding the difference between the average and actual observations, squaring each difference, summing the squared differences, finding the average squared difference (called the variance) and taking the square root of the variance.

STANDARD ERROR—Applied to statistics such as the mean, to provide a distribution within which samples of the statistics are expected to fall.

STANDARD RATIO—A relationship based on a sample distribution by value for a particular company. When the standard ratio for a particular company is known, certain aggregate inventory predictions can be made like the amount of inventory increase that would be required to give a particular increase in customer service.

STANDARD TIME—The length of time determined by time study engineers that should be required to (a) set up a given machine or assembly operation; (b) run one part/assembly/end product through that operation. This time is used in determining machine requirements and labor requirements. Also, frequently used as a basis for incentive payrolls and cost accounting.

STANDING ORDER—An order with a vendor to supply a certain amount of material at specified intervals or as released until further notice. Syn: supply contract.

START DATE—The date that an order should be placed into the shop based upon some form of scheduling rules. The start date should be early enough to allow time to complete the work, but not so early to overload the shop. (cf. scheduling rules).

STATISTICAL INVENTORY CONTROL—See: scientific inventory control.

STEP BUDGETS—A step budget establishes anticipated targets at which an operation will perform for each step or level of production. It might be said then that a step budget is four, five, six, seven, etc., different fixed budgets. This method of budgeting was introduced because it was found that most of the manufacturing overhead expenditures varies in steps. They do not vary as a straight line does since it is difficult, e.g., to add to the payroll two-thirds of a person. See: flexible budgets.

STOCHASTIC MODELS—Models where uncertainty is explicitly considered in the analysis. (cf. deterministic models).

STOCK—Stored products or service parts ready for sale as distinguished from stores which are usually components or raw materials. (cf. stores).

STOCK CODE—See: part number.

STOCKCHASING—See: expediting.

STOCKKEEPING UNIT (SKU)—A stockkeeping unit represents an item at a particular location. For example, if product A is stocked at several locations, each combination of product A and a stocking location is a different SKU.

STOCK ORDER—A manufacturing order to replenish stock as opposed to a production order to make a particular product for a specific customer. (cf. manufacturing order).

STOCKOUT—The lack of materials or components which are needed to be on hand in stock. (cf. backorder).

STOCKOUT PERCENTAGE—A measure of the effectiveness with which the inventory management system responds to actual demand. The stockout percent can be a measurement of total stockouts to total line item orders, or of line items incurring stockouts during a period to total line items in the system. (cf. customer service ratio).

STOCKPOINTS—Points at which stockkeeping items can be stocked and subjected to management control. (cf. stockkeeping item).

STOCK RECORD CARD—A ledger card that contains inventory status for a given time. See: stock ledger card.

STOCK STATUS—A periodic report showing the inventory on hand and usually showing the inventory on order and some sales history for the products that are covered in the stock status report. (cf. job status).

STOP WORK ORDER—See: hold order.

STORAGE—A computer oriented medium in which data is retained. Primary storage—internal storage area where the data and program instructions are retained for active use in the system—normally core storage. Auxiliary or external storage is for less active data. These may include magnetic tape, disk, or drum.

STORES—Stored materials used in making a product. (cf. stock).

STORES ISSUE ORDER—See: production materials requisition, picking list.

STORES LEDGER CARDS—Cards on which are maintained records of the material on hand and on order.

STORES REQUISITION—See: production materials requisition, picking list.

STRAIGHT LINE SCHEDULING—See: gapped schedule.

SUB-ASSEMBLY—An assembly which is used at a higher level to make up another assembly. For example, an automobile carburetor is a sub-assembly going into the automobile engine which is an assembly. (cf. component). Syn: intermediate.

SUB-OPTIMIZATION—A term describing a problem solution that is best from a narrow point of view but not from a higher or overall company point of view. For example, a department manager who would not work his department overtime in order to minimize his department's costs may be doing so at the expense of overall company profitability.

SUM OF DEVIATIONS—See: Cumulative Sum.

SUMMARIZED BILL OF MATERIAL—A form of multi-level bill of material, which lists all the parts and their quantities required in a given product structure. Unlike the Indented bill of material it does not list the levels of assembly and lists a component only once for the total quantity used.

SUPER BILL (OF MATERIAL)—A type of planning bill, located at the top level in the structure, which ties together various modular bills (and possibly a common parts bill) to define an entire product or product family. The "quantity per" relationship of super bill to modules represents the forecasted percentage popularity of each module. The master scheduled quantities of the super bill explode to create requirements for the modules which also are master scheduled. (cf. planning bill, modular bill, common parts bill).

SUPPLIER LEADTIME—See: vendor leadtime.

SUPPLIES—Materials used in manufacturing which are not normally charged to the finished production, such as cutting and lubricating oils, machine repair parts, glue, tape, etc. Syn: general stores, indirect material. (cf. floor stock).

SYMBOLIC LANGUAGE—A language used in programming which is convenient for the programmer because it uses mnemonic terms that are easy to remember. Once the program has been written in symbolic language, it must be converted to absolute language using a "processor program."

SYNTHETIC TIME STANDARD—See: predetermined motion time.

SYSTEM—A group of objects or procedures organized and interconnected to perform a desired function in a desired way. (cf. servo system).

SYSTEM DEVELOPMENT METHODOLOGY—A formal, organized approach to be followed in the planning, development, installation, and evaluation phases of a business application system. (cf. project model).

SYSTEM REQUIREMENTS DEFINITION PHASE—The portion of system development whose purpose is to investigate a company, or part of a company, in sufficient depth to develop a firm business proposition involving a changed method of operation. It results in a statement of the functional requirements of new systems.

T

TABLE LOOK-UP—A computer technique that stores a table of data in a computer so that the data can be used during the running of the program.

TAPE LIBRARY—A low cost method of secondary data storage. Back-up copies of master files and transactions can be stored for security, legal, or infrequent use purposes.

TARGET INVENTORY LEVEL—The equivalent of the "maximum" in a min-max system. The target inventory is equal to the order point plus the order quantity. It is often called an "order up to" inventory level and is used in a periodic review system. (cf. min-max system).

TELEPHONE COMMUNICATIONS—The method of transmitting data over long distances using an ordinary telephone network. Communication with a computer can be accomplished using an acoustic coupler. Page transmitters use a tele-copier to send and receive complete pages of data.

TELEPROCESSING—Processing of data which is received from or sent to remote locations over communications lines; also called telecommunications, or simply TP.

TELESCOPING—See: overlapped schedule.

TERMS AND CONDITIONS—A general term used to describe all of the provisions and agreements of a contract.

TERMINAL—A remote input or output unit which is directly connected to a computer.

THIRD ORDER SMOOTHING—See: triple smoothing.

TIME BUCKET—In an MRP system, this refers to the number of days summarized into one columnar display. A weekly time bucket

would contain all of the relevant planning data for an entire week. Weekly time buckets are considered to be the largest possible (at least in the near and medium term) to permit effective MRP. (cf. bucketless system).

TIME CARD—A document recording attendance time, often used for indicating the number of hours for which wages are to be paid. (cf. labor claims).

TIME FENCE—A policy or guideline established to note where various restrictions or changes in operating procedures take place. For example, changes to the master production schedule can be accomplished easily beyond the cumulative leadtime whereas changes inside the cumulative leadtime becomes increasingly more difficult to a point where changes should be resisted. Time fences can be used to define these points.

TIME PHASED CONTRACT—Refers to the practice of showing requirements, scheduled receipts, the projected available balance, and planned order releases in their proper time relationship to each other to the vendor.

TIME PHASED ORDER POINT (TPOP)—MRP for independent demand items. Gross requirements come from a forecast, not via explosion. This technique can be used to plan warehouse inventories as well as planning for service (repair) parts since MRP logic can readily handle items with dependent demand, independent demand or a combination of both (cf. distribution requirements planning).

TIME SERIES—A set of data that are distributed over time, such as demand data in monthly time period occurrences.

TIME SERIES ANALYSIS—Analysis of any variable classified by time, in which the values of the variable are functions of the time periods.

TIME SHARING—The use of a single computer by more than one person where the computer handles each requirement so fast that each person feels that he has the computer to himself. (cf. multi-processing).

TIME STANDARD—The predetermined labor times allowed for the performance of a specific job. The standard will often consist of two parts, that for machine set up and that for actual running. The standard can be developed through observation of the actual work (time study), summation of standard micro motion times (synthetic time standards), approximation (historical job times). (cf. predetermined motion time).

TIME TICKET—A labor claim entered by an operator frequently in the form of a handwritten report or a punched card.

TOOL ISSUE ORDER—See: tool order.

TOOL ORDER—A document authorizing withdrawal or issue of specific tools from the tool crib or other storage. (cf. work order).

TOTAL REVENUE—Sum of all revenues. Gross income.

TOTAL-SYSTEMS CONCEPT—A management information system concept which considers the entire organization as a system. Through either manual or computerized systems the intent is to provide decision making information in an accurate and timely manner. (cf. system development methodology).

TOTAL VALUE ANALYSIS—A method of economic analysis in which a model expresses the dependent variable of interest as a function of other independent variables some of which are controllable. (cf. incremental analysis).

TPOP—Abbreviation for time phased order point.

TRACER—A request upon a transportation line to trace a shipment for the purpose of expediting its movement or establishing delivery.

TRACKING SIGNAL—The ratio of the cumulative algebraic sum of the deviations between the forecasts and the actual values to the mean absolute deviation. Used to signal when the validity of the forecasting model might be doubtful.

TRAFFIC—An organization charged with responsibility for arranging the most economical classification and method of shipment for both incoming and outgoing materials and products.

TRANSIENT BILL OF MATERIAL—A bill of material coding and structuring technique used primarily for transient (non-stocked) subassemblies. For the transient subassembly item, lead time is set

to zero and lot-sizing is Lot-For-Lot. This permits MRP logic to drive requirements straight through the transient item to its components, but retains its ability to net against any occasional inventories of the subassembly. This technique also facilitates the use of common bills of material for engineering and manufacturing. Syn: phantom bill of material, blow through.

TRANSIT TIME—A standard, arbitrary, allowance that is given on any given order for the physical movement of items from one operation to the next.

TRANSPORTATION INVENTORY—Inventories that exist because material must be moved. For example, if it takes two weeks to replenish a branch warehouse on the other side of the country, inventory equivalent to approximately two weeks of sales will normally be in transit and therefore this will be extra inventory. (cf. movement inventory).

TRANSPORTATION METHOD—A linear programming model concerned with the minimization of costs involved in supplying requirements at several locations from several sources with different costs related to the various combinations of source and requirement locations.

TRAVEL TIME—See: transit time.

TRAVELER—A copy of the manufacturing order that actually moves with the work through the shop. (cf. shop packet).

TRAVELLING PURCHASE REQUISITION—A purchase requisition designed for repetitive use. After a purchase order has been prepared for the goods requisitioned, the form is returned to the originator who holds it until a repurchase of the goods is required. The name is derived from the repetitive travel between the originating and purchasing departments. Syn: traveling req.

TRAVELLING REQUISITION—See: travelling purchase requisition.

TREND FORECASTING MODELS—Methods for forecasting sales data when a definite upward or downward pattern exists. Models include double exponential smoothing, regression, and additive trend.

TRIGGER LEVEL—See: order point.

TRIPLE SMOOTHING—A method of exponential smoothing for accelerating trend, such as would be experienced in a fad cycle.

TURNAROUND—1. The time span in days between receipt of order and shipping date. 2. The time required to shut-down, clean, repair, and start-up a processing plant.

TURNAROUND COSTS—See: changeover cost.

TURN OVER—The number of times inventory is replaced during a time period; in other words, a measurement of investment inventory to support a given level of sales. It is found by dividing the cost of goods sold for the period by the average inventory for the period. (cf. inventory turn over).

TWO BIN SYSTEM—A type of fixed order system in which inventory is carried in two bins. A replenishment quantity is ordered when the first bin is empty. When the material is received, the serve bin is refilled and the excess is put into the working bin. This term is also used loosely to describe any fixed order system even when physical "bins" do not exist. (cf. fixed order system).

TWO-LEVEL MPS—A master scheduling approach wherein a super bill (of material) is master scheduled along with selected key options, features and attachments.

U

UNIT COST—Total labor, material, and overhead cost for one unit of production, i.e. one part, one gallon, one pound.

UNIT OF MEASURE—The unit in which quantitative data regarding an item is expressed. Examples are each, pounds, gallons, feet, etc.

UNIT OF MEASURE (PURCHASING)—The unit used to purchase an item. This may or may not be the same unit of measure used in the internal systems. Purchasing buys steel by the ton, but it may be issued and used in square inches.

UNIT PRICE—The price for each unit.

UNIT RECORD EQUIPMENT—Conventional punched card data processing machines operated by control panel as differentiated from stored program computers.

UNIVERSE—The population, or large set of data, from which samples are drawn. Usually assumed to be infinitely large or at least very large relative to the sample. (cf. sampling).

UNLOAD—See: output.

UNPLANNED ISSUE/RECEIPT—An issue or receipt transaction which updates the quantity on hand but for which no order or allocation exists in the data base.

USAGE—The number of units or dollars of an inventory item consumed over a period of time.

USE AS IS—Material that has been dispositioned as unacceptable per the specifications, however, the material can be used within acceptable tolerance levels.

V

VALUE ANALYSIS—The systematic use of techniques which serve to identify required function, establish a value for that function, and finally to provide that function at the lowest overall cost. This approach focuses on the functions of an item rather than the methods of producing the present product design.

VARIABLE—A quantity which can assume any of a given set of values. (cf. constant).

VARIABLE COSTING—An inventory valuation method in which only variable production costs are applied to the product; fixed factory overhead is not assigned to product. Variable production costs are direct labor, direct material, and variable overhead costs. Costing can be helpful for internal management analysis but is not widely accepted for external financial reporting. For inventory order quantity purposes, however, the unit costs must include both the variable and allocated fixed costs in order to be compatible to the other terms in the order quantity formula (cf. absorption costing, variable costs, fixed costs).

VARIABLE COSTS—An operating cost that varies directly with production volume, for example: materials consumed, power, direct labor, sales commissions. (cf. fixed cost).

VARIANCE—1. The difference between the expected (or budgeted or planned) and the actual. 2. In statistics, the variance is a measure of dispersion of data.

VENDOR—A company or individual that supplies goods or services.

VENDOR ALTERNATE—Other than the primary vendor. The alternate vendor may or may not supply a percentage of the items purchased, but is usually approved to supply the items.

VENDOR LEADTIME—The time that normally elapses between the time an order is placed with a supplier and his shipment of the material.

VENDOR MEASUREMENT—The act of measuring the vendor's performance to the contract. Measurements usually cover delivery, quality, and price.

VENDOR NUMBER—A numerical code used to identify a vendor from another vendor.

VENDOR SCHEDULER—An individual whose main responsibility is insuring vendor performance to the schedule. The position usually consists of taking the MRP output reports, communicating directly with the vendor in terms of ordering and rescheduling the required purchased material, and assuming the responsibility for delivery on the promised date. This includes communicating in advance with the master scheduler when parts will not arrive on time to support the schedule. By using vendor scheduler approach, the buyer is then freed from day-to-day order placement and expediting and thus has the time to do cost reduction, negotiation, vendor selection, alternate sourcing, etc. (cf. buyer).

VERTICAL DISPLAY—A method of displaying or printing output from

an MRP system where requirements, scheduled receipts, projected balance, etc. are displayed vertically, i.e. down the page. Vertical displays are often used in conjunction with bucketless systems. (cf. horizontal display, bucketless system).

VISUAL INSPECTION—A term generally used to indicate inspection performed without the aid of test instruments.

VISUAL REVIEW SYSTEM—A simple inventory control system where the inventory reordering is based on actually looking at the amount of inventory on hand. Usually used for low-value items like nuts and bolts. (cf. two bin system).

VOICE RECOGNITION ACCURACY—The degree to which voice recognition equipment will correctly encode the input utterance without repeated inputs or corrections; higher recognition accuracy provides faster data input.

VOICE RECOGNITION EQUIPMENT VOCABULARY SIZE—The number of utterances (words or short phrases) that can be distinctly recognized and digitally encoded. The larger the vocabulary, the more complex the source data that can be handled without special software.

VOUCHER—A written instrument that bears witness or "vouches" for something. Generally a voucher is an instrument showing services have been performed, or goods purchased, and authorizes payment to be made to the vendor.

W

WAGNER-WHITIN ALGORITHM—A mathematically complex dynamic lot sizing technique that evaluates all possible ways of ordering to cover net requirements in each period of the planning horizon, to arrive at the optimum ordering strategy for the entire net requirements schedule.

WAIT TIME—See: queue time.

WAITING LINE THEORY—See: queuing theory.

WALL-TO-WALL INVENTORY—Production material, parts, and assemblies may enter the plant at one end and are processed through the plant to end product without ever having entered a formal stock area. When this technique is used the inventory is referred to as wall-to-wall inventory.

WAREHOUSE DEMAND—The need for an item in order to replenish a branch warehouse. Syn: branch warehouse demand.

WARRANTY—An undertaking, either expressed or implied, that a certain fact regarding the subject matter of a contract is presently true or will be true. The word should be distinguished from "guarantee"

which means a contract or promise by one person to answer for the performance of another.

WEIGHTED AVERAGE—An averaging technique where the data to be averaged are non uniformly weighted. The weights must always sum to 1.00 or 100%.

WHAT IF ANALYSIS—The process of evaluating alternate strategies. Answering the consequences of changes to forecasts, manufacturing plans, inventory levels, etc. Some companies have the capability of submitting various plans as a "trial fit" in order to find the best one. Syn: simulation.

WORD—A number of characters that are reserved for one item of data. The length of a word may be fixed in some computers or variable in others. (cf. bit, byte).

WORD PROCESSING—A method of storing and manipulating text data in a computer. Data can be edited automatically, added, changed or deleted automatically and printed on remote terminals in different character fonts, form size, etc.

WORK CENTER—A specific production facility, consisting of one or more people and/or machines, which can be considered as one unit for purposes of capacity requirements planning and detailed scheduling. (cf. cost center).

WORK IN PROCESS—Product in various stages of completion throughout the plant including raw material that has been released for initial processing and completely processed material awaiting final inspection and acceptance as finished product or shipment to a customer. Many accounting systems also include semi-finished stock and components in this category. Syn: in-process inventory. (cf. movement inventory).

WORK IN PROGRESS—See: work in process.

WORK ORDER—See: manufacturing order. Frequently the term work order is used to designate orders to the machine shop for tool manufacture or maintenance.

WORK SAMPLING—The use of a number of random samples to determine the frequency with which certain activities are performed.

WORK STATION—The assigned location where a worker performs his job; it could be a machine or a work bench. (cf. work center).

WORK TICKET—See: work order.

Y

YIELD—The ratio of usable output from a process to the materials of value input to the process. Yield is usually expressed as a percentage and may be in terms of total input or of a specific raw material.

YIELD RATE—See: shrinkage rate.